The FOUNDRY

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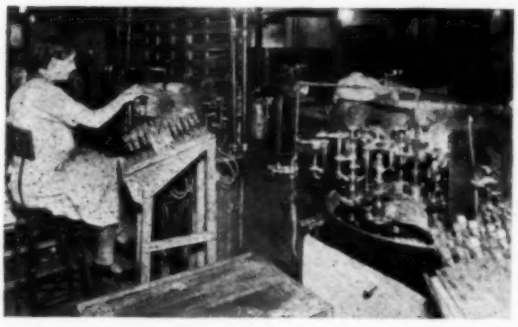
Castings Are Used in Radio Tube Making Machinery

MANUFACTURE of radio tubes is an interesting process. One of the first operations is the cutting of glass tubing to the desired length in gas-fired, hot cut, flare machines. The flare end then is placed over wires



Courtesy Brooklyn Union Gas Co., New York

Machines Are Used To Seal the Wires in the Flare of the Radio Tube

and exhaust tubing, and is fed automatically through gas-fired machines which force the glass between the wires and form a seal. The unit is annealed to prevent cracks. Following the annealing process, the wires are cut to the proper length and bent, the product is transported to the mounting department and the glass bulb is welded onto the stem. The tube then is taken to the exhaust machine where it is evacuated and the coating filament reduced from a carbonate to an oxide. To drive off any gases in the tubes the elements are heated by induction. Next, wires in the tube are threaded through the base filled with bakelite cement and the assembly baked at 320 degrees Fahr. Finally the wires are soldered onto the prongs at the tip of the base and the tubes are tested for flaws. Many operations in the manufacture of radio tubes are performed on automatic machines which are constructed largely of castings.

Find Where Castings Can Be Sold

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Caterpillar

RECLAIMS CORE SAND By Washing Method

A CONSIDERABLE amount of core sand is used in making the cores necessary for the production of the type of castings employed in the manufacture of tractors by the Caterpillar Tractor Co., Peoria, Ill. In making the castings, considerable deterioration of the core sand necessarily is encountered. This situation develops through contamination as a result of burnt grains of sand, which are of no particular value in the making of cores, and other substances including granulated cupola slag, which is included in the core for venting purposes.

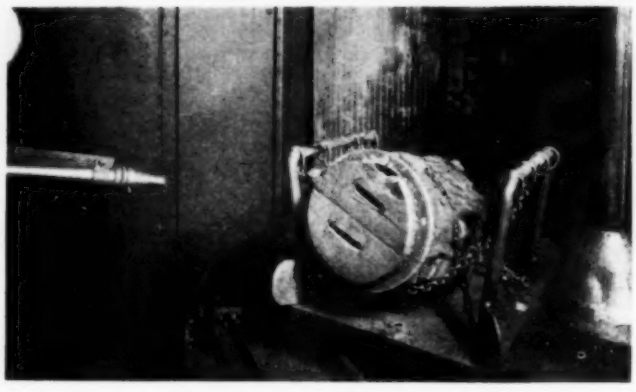


Fig. 1—Interior of Hydraulic Core Knockout Unit

Equipment which is utilized in removing the core sand from the casting and reclaiming it for further use is shown in the accompanying illustration. A large transmission case weighing 1600 pounds, with core sand and rods intact, is shown in Fig. 2. The casting is strapped firmly to a small revolving table which in turn is mounted on a large revolving table. The large table has a baffle plate in the center, as shown in the illustration, which acts as a seal in the hydraulic core knockout machine when the table is turned so that the casting is in the washing compartment. The same casting after the washing process is shown in Fig. 3. The washing action takes place in the interior of the hydraulic core knockout machine as shown in Fig. 1. An operator has control of the fire nozzle turret, shown in the illustration, and he is able

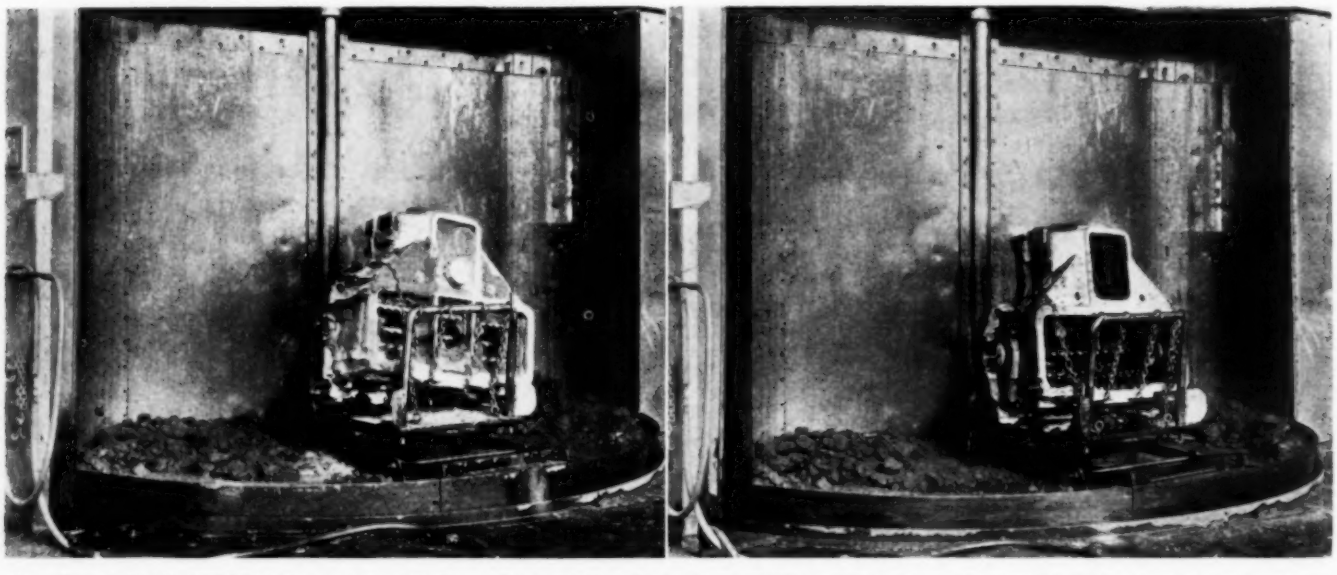


Fig. 2—A Casting Chained to a Small Revolving Table Mounted on the Large Table. Fig. 3—The Casting After the Cores Were Washed Away

By

M. J. Gregory

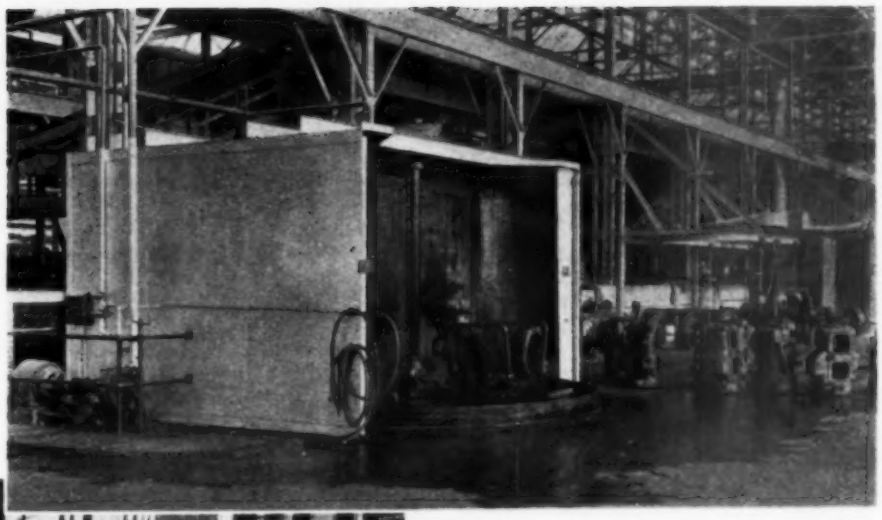
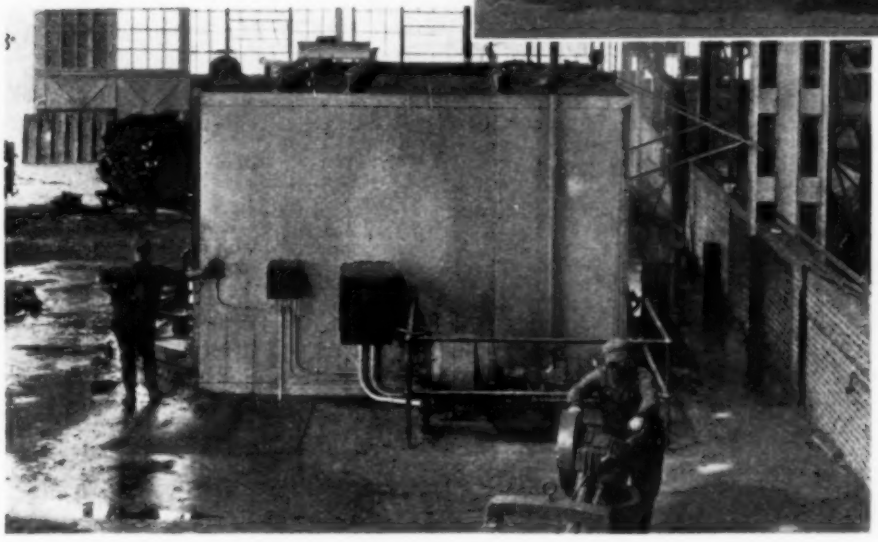


Fig. 4 (Below)—Side View of the Hydraulic Core Knockout Unit with Force Pump in the Foreground. Fig. 5 (Right) — The Sludge Pump Is Shown at the Left



to see the work being washed through a shatter proof glass. In this way the operator is in complete control of the operation at all times. Water for the operation is supplied at 400 pounds pressure by a five-stage centrifugal pump, which is shown at the side of the core knockout unit in Fig. 4.

Core sand becomes disintegrated by the force of the water and falls through small openings in the large revolving table. The sand then is carried into a sump along the side of the core knockout. As the sand and water mixture falls into the sump, it passes through grates which retain the major portion of the nails and small rods. The material which gathers at that point is cleaned out every night. The grate covering the sump and the sludge pump are shown in the lower left hand corner of Fig. 5. The pump sucks the sand and water from the sump and deposits it into the settling pits outside the building, which are shown in Figs. 6 and 7. Under normal working conditions, approximately 2 days are required to fill one of the settling pits, which has a capacity of about 150 tons of sand. The stream of sand and water, which is shown in Fig. 6, then is diverted into the second settling basin. Approximately 5 hours after the pit has been filled and the sand and water mixture turned into the other basin, a tractor, which was made by the Caterpillar company and is equipped with a special loading attachment, is driven into the pit and is used to fill a train of 20 cars, each holding 3½ tons of sand. The sand taken from the basin is in such condition that it does not require any screening or drying. It is then

Fig. 6 (Left)—A Specially Equipped Tractor Picking Up the Sand. Fig. 7 (Right)—Loading Sand in the Cars. The Pipe Carrying the Mixture of Water and Sand Is Shown at the Right

hauled with a tractor to the storage bins adjacent to the core sand mixing units.

Water for the washing and reclaiming operation is obtained from wells and costs approximately 1 cent per 1000 gallons for the pumping operation. The water serves a threefold purpose. It removes the cores and washes the castings; it acts as a vehicle in moving the sand to the settling basins; and it washes the fines and undesirable particles of sand away. The water finally finds its way into an adjacent sewer.

The following is the average screen test of the reclaimed sand:

	Per cent
Remaining on 30 mesh	2.00
Remaining on 40 mesh	22.50
Remaining on 50 mesh	38.00
Remaining on 70 mesh	19.00
Remaining on 100 mesh	10.50
Remaining on 140 mesh	4.50
Remaining on 200 mesh	3.00
Remaining on 270 mesh	0.50
Pan	0.00

Approximately the following mixture is used in making cores for castings such as are shown in the accompanying illustrations: 50 per cent reclaimed sand, 40 per cent silica sand, 10 per cent bank sand with additions of linseed base core oil and cereal binders. That typical mixture carries a tensile strength of 155 pounds per square inch and an average permeability of 160 when baked, according to the American Foundrymen's association standards.

By reclaiming the core sand, conditions within the sandblast booth are improved, since the castings passing through the washing process have less sand upon them, thereby reducing the amount of dust within the sandblast booths. The castings are blasted by the use of steel grit with sufficient sandblast sand added to absorb any moisture that may be on the castings, thus preventing clogging of the sandblast equipment. All of this tends to make a more workable condition at that point.

Reader's Comment

EDITOR'S NOTE—*Material Appearing Under This Head Does Not Necessarily Reflect the Opinion of* THE FOUNDRY *or of Its Editors.*

What Dark De Hole?

TO THE EDITORS:

Every time this good old earth rolls round on its axis and without either a Timken or an Alliance bearing, it means one more day of depression in the discard. Here we are, all hanging on, working and hoping for something better. Nobody ever imagined that people could go through times like these, but we are doing it, and one of these days the current will flow in the right direction. The job is to keep on hanging on, and this reminds us of how it was done by two dusky gentlemen in search of plunder.

Rastus and Sambo had tracked an old she-bear to her den, and soon discovered that a family of small cubs were among the tangible assets. The den was hard of approach and access. They took counsel in the matter of ingress, egress and regress, and being long on the art of possession without due process of law, undertook the adventure. Sambo was selected to stand guard, having had military training and the experience being under fire while calling on a neighboring hen roost. Rastus was busily engaged in assembling the spoils of war inside of the den when suddenly the place grew dark, and he called out, "Sambo, what dark de hole?" A heavy, strained voice came back, "If dis yere tailhold done break, you soon fine out what dark de hole."

Possibly Col. Ayres and Babson could make the discovery that the majority of business and industrial concerns are about two jumps ahead of the sheriff, and with a tailhold none too firm. If somebody goes into a stampede there will be a condition of shambles and industrial ruin never before seen in this country, but the fine part of it all is the way good men are laying hold of the tail of opportunity, and if the grip does not loosen there will be less demand for red ink in the ledger.

Please accept best wishes that the tailhold aforesaid may be strong, feet well planted, and courage ample for the things we need and to which we are all justly and fairly entitled.

ROBERT C. HOPKINS

Alliance Brass & Bronze Co.,
Alliance, O.

Announce Program for Institute Meeting

Cost, technical and distribution problems will feature the program of the fourth annual convention of the Gray Iron institute, to be held at West Baden Springs, Ind., Oct. 15 and 16. Prominent speakers will appear on the cost and technical session programs, and George L. Willman, Chicago, sales counselor, will conduct a merchandising clinic Friday morning.

The tentative program, as announced by Arthur J. Tuscany, manager of the institute, is as follows:

Thursday Morning

Registration, visitation, committee meetings.

Inaugural session—group luncheon. Opening remarks by President B. H. Johnson.

Thursday Afternoon

Report of Officers—B. H. Johnson, president, William J. Grede, treasurer, Arthur J. Tuscany, manager.

Reports of Committees: Finance and budget, H. S. Chafee, chairman; membership, Charles F. Scherer, chairman; trade information, C. B. Magrath, chairman; trade practice, E. L. Wieland, chairman.

Cost Session. Report of cost committee, J. L. Carter, chairman.

"Rate Setting in Gray Iron Foundries," round table discussion led by William J. Grede, Liberty Foundry Inc., Wauwatosa, Wis.

"The Foundry Balance Sheet and Budget—How They Help You," by R. O. Flanders, Blue Valley Foundry Co., Kansas City, Mo.

"Savings from Comparative Cost Reports; Actual Experiences in Local Cost Groups," by Charles A. Klaus, Eastern cost consultant.

Thursday Night

Dinner Meeting. "Relationship of Various Institute Activities and What it Means to Your Individual Company."

"How the Institute Activities Can Help You Through Local Groups: Cost Activities, Merchandising Activities, Technical Activities."

Friday Morning

Report of the technical committee, H. B. Hanley, chairman.

"Interpretation of the Technical Bulletins."

"Proposed Specifications."

"Standard Practices and What They Mean to the Industry," by Oliver Smalley, technical director, Gray Iron institute.

Merchandising Session. Report of the Merchandising committee, J. H. Bruce, chairman.

"Merchandising Clinic—the What-to-do and How-to-do of Increasing Markets," by George L. Willman, sales counselor, Chicago.

Report of nominating committee, George M. Morrow, chairman.

Election of directors.

Noon Session

Group Luncheon. "Employment in the Gray Iron Industry," by W. J. Barrett, Metropolitan Life Insurance Co.

Open forum for the discussion of any subject which gray iron foundrymen wish to present.

Report of resolutions committee, John K. Raithel, chairman.

The golf tournament will begin at two o'clock.

Friday Evening

Annual Dinner. Awarding of golf prizes by Don McDaniel, chairman of the golf committee.

Surprise feature.

"Impressions of the Convention"—Dan M. Avey, editor of The Foundry.

A special program has been arranged for the ladies attending the convention. On Thursday afternoon, a bridge tea will be held. On Friday they will inspect the grounds in the morning at West Baden and attend a group luncheon in the afternoon.

Suggests Classification of STEEL FOR CASTINGS

By R. A. Bull

IT IS not surprising that the increasing production of steels for castings, differing in chemical composition from that previously employed to large extent in making the steel foundry product, should have resulted in conflicting opinions as to where to draw the line between the combination of chemical elements in a typical carbon steel casting and that of the elements in a casting that should be known as a product of alloy steel.

The variable extent to which each element is employed in three of the five customarily associated in the composition of steel has led, quite naturally, to divergent ideas regarding limitations for classifying the material as being of the carbon grade, or one of the alloy grades. Some interesting situations have developed as the result of the absence of an acceptable boundary line, and, in a few cases, troublesome misunderstandings have occurred.

The author wishes to explain that he adheres to no arbitrary opinion regarding differentiation. His purpose in centering attention on the subject is to prompt an interchange of opinions which might lead to general agreement. Such a result unquestionably would be helpful to consumers and advantageous to producers.

It may be the difficulty of differentiation that has induced a few manufacturers to describe the metal in steel castings as *common* and *special*, rather than as *carbon* and *alloy*. This practice has points in its favor, but it possesses disadvantages, one of which is the impression created in the minds of some users that the term *common* identifies a material made without much regard for quality.

Of course, the word *uncommon*, as the antonym of common, implies the extraordinary, but it is significant, for the purpose now in mind, that there appears to be no word in our language which means something that is usual or ordinary as to the proportions of its component parts and at the same time is capable of production with every consideration for care and skill in manufacture.

Nomenclature Is Faulty

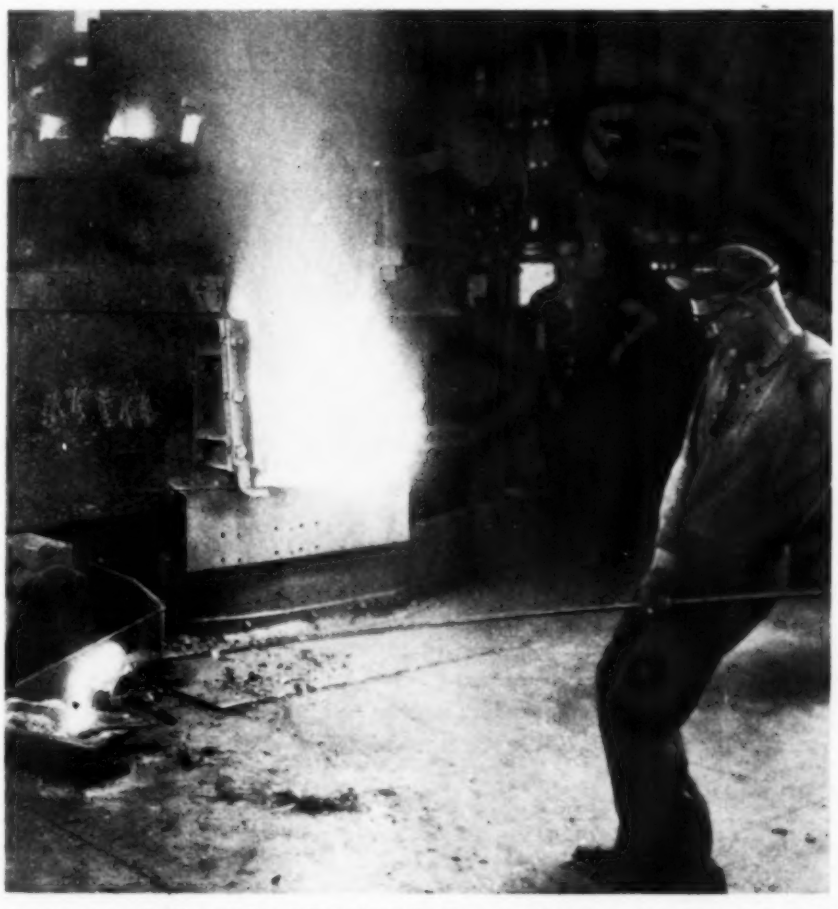
A factor that in all probability has been the chief cause for misunderstanding in classifying the product of the steel foundry, lies in the rapidly extended use of castings that might be called *slightly alloyed* as they contain small amounts of nickel alloys.

The most outstanding example of such a material is steel that is normal as to the content of each element excepting manganese, and often containing about 1.25 per cent of that element. Probably this is the cheapest steel made for castings which belongs, for the present, in what some would consider outside the category of metals usually thought of by many persons when discussing alloy steels in general terms.

There are a few steel foundrymen who have maintained that metal of the composition referred to should not be considered as having chemical properties justifying classification among alloy steels for castings. Nevertheless, these producers do not deny the desirability of identifying the material as being different chemically and physically from the regular grade of steel. Its present importance justifies a definite place in a proper classification.

Incidentally, the commercial significance of metal of the kind mentioned supplies a reason for its separate identification in its own grade of alloy material, so that it may be distinguishable readily from manganese steel of the austenitic variety. It is not convenient to describe it as pearlitic manganese steel. If we call it medium manganese steel, meaning that it has a content of manganese intermediately between the amount of manganese in regular or common steel, and the amount of that element in Hadfield's manganese steel, some erroneous impressions might be avoided.

However, it is the present purpose of the author not to propose satisfactory descriptions of any individual variety of alloy steel, but to suggest for debate suitable names and means for applying



Common or Ordinary Steel Requires Every Consideration for Care and Skill in Manufacture

them to groups of steel into which the metal appears to divide itself.

The arguments that have been advanced in some quarters, that metal we have described as of the medium manganese variety should not be considered as an alloy grade, are based on the individual's interpretation of the term alloy steel. It may be useful for us to consider what is meant by that description; likewise, what is meant when we use the term steel, without qualifications.

Defines Steel

Bradley Stoughton, in his *Metallurgy of Iron and Steel*, offers a definition for steel which is probably as satisfactory as any. He describes it thus: "Iron which is malleable at least in some one range of temperature, and in addition is either (a) cast into an initially malleable mass, or (b) is capable of hardening greatly by sudden cooling, or (c) is both so cast and so capable of hardening." It would seem that the careful consideration and general acceptance of this definition might terminate some controversies in respect to properly applicable terms to give certain ferrous metals that are noticeably of the high alloy variety.

Webster's *International Dictionary* describes an alloy as follows: "A substance composed of two or more metals intimately united, usually by fusing the components together; also the state of union of the components; as brass is an alloy of copper and zinc."

All industries realize that every commercial ferrous product is an alloy. One might say that it was incorrect in the first place to apply the word alloy as a distinguishing one, to a separate division of a material of such noticeably alloyed qualities as steel must be. However, it would serve no good purpose, in emphasizing an inaccuracy impracticable to eliminate, due to continued universal acceptance, to advocate the employment of another term than alloy, used in connection with steel, for a comprehensive portion of the product which differs, in the combination of chemical elements composing it, from what is conceded to be average constitution of the metal as made for ordinary purposes, and possessing what may be called average properties. Obviously, we must continue to use the term alloy steel as meaning a material that is distinguishable from the regular grade of steel, in respect to its chemical components.

The term *carbon steel*, which is, to most persons, synonomous with *common steel*, has been employed for years to indicate physical properties in the metal which are chiefly the result of the percentage of contained carbon. It is impossible to draw the line definitely, in any such consideration, and it would be a waste of time to try to establish mathematical ratios to indicate accurately, for all the characteristic properties of the metal ordinarily required in industry, speaking particularly of structural purposes, what portion of the result is attributable to the carbon content, what portion is due to the manganese content, and what part the silicon content plays. It seems satisfactory, for identification purposes, to continue to call the simplest grade of steel used for castings, carbon steel.

Maj. R. A. Bull

Perhaps the most logical step in an attempted suitable designation of the grade that includes 1.25 per cent manganese steel, which might or might not contain the customary percentage of silicon, and contains, usually, a relatively low or an intermediate percentage of carbon, might be to consider the proportions of the five elements customarily determined in steel, as usually found in the regular grade of the metal produced in the foundry.

Thoughtful consideration of the entire matter seems, to the author, to lead to the following conclusions:

(a) There should be chemical limitations agreed to in the steel casting industry, prompting general acceptance in the industries served, for defining concisely that products of the steel foundry which, by virtue of its chemical constituents, belongs rightfully in that grade which is meant when we speak of the *garden variety* of steel for castings, and which has been used for the bulk of the steel foundry output since the industry began its career in America.

(b) There should be general agreement on a definition collectively applied to those varieties of foundry steel which are *slightly alloyed*, and lie in the intermediate zone between steel of customary chemical composition and steel that has such chemical constituents as now to permit classification without possibility of confusion on the part of anyone.

(c) Useful purposes would be served by a general agreement differentiating steels for castings universally recognized as of the *alloy grade*, but which do not touch another borderland, beyond which we now ordinarily classify the metal as being of the high alloy grade, sometimes called steel and occasionally given the inclusive designation of ferrous metal.

Points for Discussion

The author is prompted to suggest for discussion the following lines of demarkation, based on what is *intentionally* included in the composition:

(a) Steel castings to be considered as being of the regular carbon grade when the content of carbon is not less than 0.22 per cent, or more than 0.35 per cent; when the content of manganese is not less than 0.50 per cent, or more than 0.90 per cent; when the content of silicon is not less than 0.20 per cent, or more than 0.70 per cent; when the content of phosphorus is not more than 0.05 per cent; when the content of sulphur is not more than 0.06 per cent; and when there is no other element other than those mentioned, in an appreciable proportion.

(b) Steel castings to be considered as being of the special carbon grade when the contents of four elements and no additional ones other than carbon, as indicated in the foregoing schedule under (a), are found in the material; and when the proportion of carbon is less than 0.22 per cent, or more than 0.35 per cent, but is low enough to give the metal the essential qualities of steel.

(*Concluded on Page* 65)

Confusion Exists

DIVERGENT ideas exist regarding limitations for classifying steel castings in the carbon or alloy grades. Some method of classification is needed whereby the designation of the various grades would be simplified. The author who is director, Electric Steel Founders' Research group, suggests a method based on chemical composition of the steel used in the castings. In this article, which is abstracted from a paper presented at the Chicago convention of the American Foundrymen's association, he divides steel castings into five groups on basis of their composition as follows: Regular carbon; special carbon; simple alloy; low or regular alloy; and high alloy. Emphasis is laid on the confusion which has resulted from the production of medium manganese steel. Widely divergent views on its classification have arisen. According to the author's classification, that type steel is placed definitely in the group in which it belongs.

Prevent Losses With Proper Gates and Risers

By Pat Dwyer

EVERY foundryman is familiar with the phenomenon of a casting produced day by day with clock like regularity and then for no apparent reason the casting is defective for one or two or more days, or until a remedial or preventative measure is discovered and installed. In some instances the underlying cause of the defect is simple and discovered easily. In other instances the cause is not immediately apparent and can be discovered only by experiment and a process of eliminatoin. A typical instance is illustrated in Fig. 89, a mold for two packing rings, one 24 and the other 36 inches in diameter, the smaller ring molded inside the larger.

The mold is dried. The outside is cheeked off and the inside is lifted on a circular plate to provide an opportunity of finishing the vertical walls of the mold and to apply the wet blacking. The body of sand between the two rings is left standing on the drag. The pattern for each ring is 14 inches deep and is drawn to form a ring casting 25 inches on the face. Usually a cinder bed is placed in the drag and after sand has been rammed to the top of the patterns the molder vents down to the cinders with a large vent wire, between ¼ and ½-inch in diameter. A ring of cinders is placed at each venting stage. The mold is gated on top and after a longer or shorter period of peace—of perfect castings—the molder reports that the castings are scabbed in front of the gates.

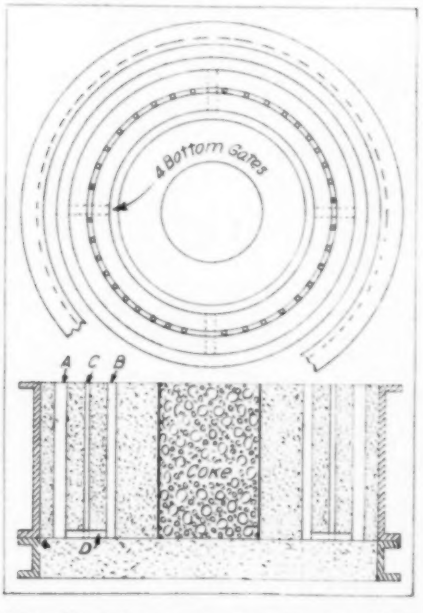


Fig. 89—Plan and Section of Mold for Two Rings with Bottom Connecting Gates in One Flask

Clean Iron

WITH a long list of factors in the sequence of operation incident to the production of a casting, factors which must synchronize or mesh as nicely as the teeth in a gear train, it is not astonishing to find that occasionally a tooth slips or jams momentarily with the result that one of the castings in any given series goes to the scrap pile. Constant attention to every detail and eternal vigilance are required to prevent these minor slips. Preventative measures take the form of special gates and runners. For medium weight and large castings, special runner cores containing a number of small gate openings have proved efficacious. On small castings made from matchplates an arrangement with the gates on the drag side and the runner on the cope side is the most satisfactory.

The question immediately arises: Why should they scab? With proper workmanship and with all the precautionary measures outlined in the preceding paragraph, a skilled molder would not hesitate to attempt these castings in green sand molds. Holding a post mortem on the defective casting, attention first is directed to the gates. Temporary carelessness may have resulted in gates set slightly at an angle, in gates with the bottoms reamed out, in gates larger than those usually employed. Under any of these conditions, the metal will impinge with considerable force on the face of the mold and wash some of the sand away.

Many molders, and others in the foundry, use the terms *cut* and *scab* indiscriminately, despite the fact that the two forms of defect are due to different causes. A scab is caused by the steam forcing a piece of sand from the face of the mold or core. A cut is caused by the stream of metal washing away a portion of the sand.

In making the mold the cinder bed might be omitted in the drag and all the vent taken off through the top. There is no advantage in trying to force the vent down through the bottom when a natural channel can be provided at the top. The only vent that needs to be taken care of is that generated in the body of sand between the two rings.

Set the drag down level, ram it full of sand, scrape it off flush with the joint, slick the face, set on the two ring patterns and adjust the lifting plate in the center. Then set the cheek on the outside and place a 12-inch bushing or a small ring pattern of some kind in the center. Set a number of 1-inch rods, pipes or round sticks about 30 inches long

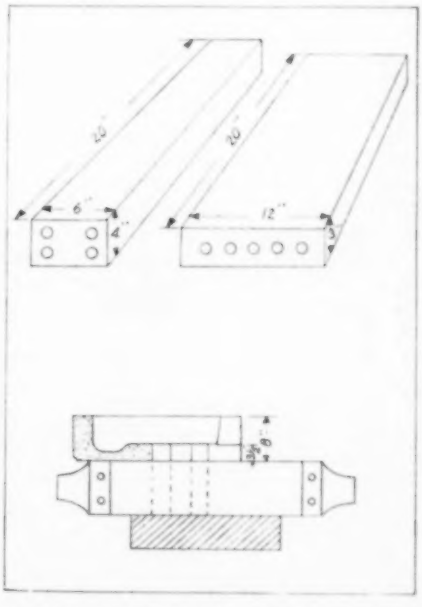


Fig. 90—(Below)—Application of Runner Cores. Above—Enlarged Perspective View of Cores

about 6 inches apart in the center of the space between the two ring patterns all around. When these are drawn out later they will leave all the vent holes that are required and there will be no need of using a vent wire. Place 4 drawgates 2 x ¾ inches spaced at equal intervals that is 90 degrees and connecting the two rings near the bottom. These will serve to correct any irregulartiy in filling the mold and will insure that the

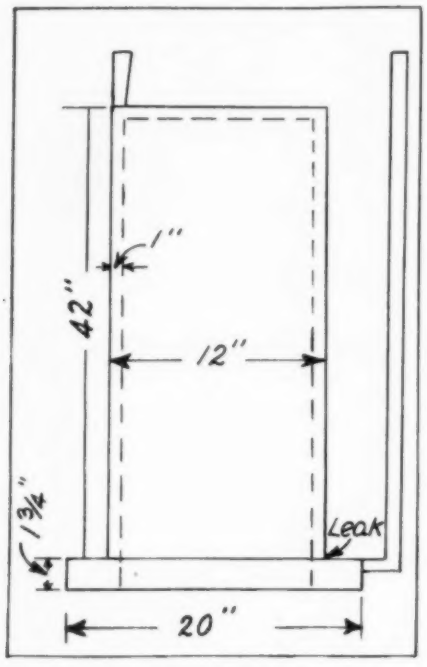


Fig. 91—The Gate Promoted a Leak at the Corner

iron in both rings will maintain an equal level while the mold is filling. The mold is rammed up to the joint in the usual manner and then the vent rods are drawn out. The bushing or ring pattern, as the case may be, is drawn up at each successive ramming and the space below filled with cinders or coke. If the mold is to be poured open, the sand is banked up around the vent holes a little higher than the top edge of the mold. If a cope is to be rammed on the job the joint is slicked off flush, the holes covered over with pieces of paper or cardboard, the gate pins, vent sticks and risers set and the cope filled with sand and rammed. In some instances the mold is covered with flat cores and in others the cope is rammed on a board or plate independent of the drag.

After the cope has been lifted off, a gate cutter is employed to cut a shallow channel connecting the tops of all the vent holes in the core. Then the patterns are taken out of the mold after which the center core is lifted out and finally the cheek is lifted off. After pulling out the four draw-gates at the bottom the mold is blacked and placed in the oven to dry It is optional whether the cheek, drag and core are assembled green and allowed to dry as a unit or are dried separately. As a general rule the latter method is preferable and should be followed.

Use Runner Cores

A prominent foundryman in the Middle West whose castings in wide variety are subjected to extremely rigid inspection and to high pressure tests, has adopted the style of runner core shown in Fig. 90. The cores are made up in quantities and in two designs. One contains four gate openings in a cluster while in the other the five gates are arranged in a straight line. To afford still greater flexibility, the gates are classified in three groups, ½, ⅝ and ¾-inch in diameter. The core blocks may be employed singly, or in groups sufficient to introduce the metal without undue delay into he mold. This man is a firm believer in hot metal and fast pouring.

Manner of applying the core blocks is shown in the lower part of the illustration. The cores are made without reinforcing rods and thus may be cut to suit the depth of any cope. The uniform length is 20 inches. On extremely deep copes, part or all of a second core may be placed on top of the first core. Whatever the depth of the cope, the core is cut off to project 3½ inches above the top.

A sheet of paper is placed over the gate openings. A runner box is set in place and rammed full of green sand. The molder cuts the basin, deep at the end and down to the paper in the space over the cores. The paper is not disturbed, but serves to keep any dirt or dust from falling into the mold. The first dash of iron from the ladle destroys the paper and exposes the upper end of the

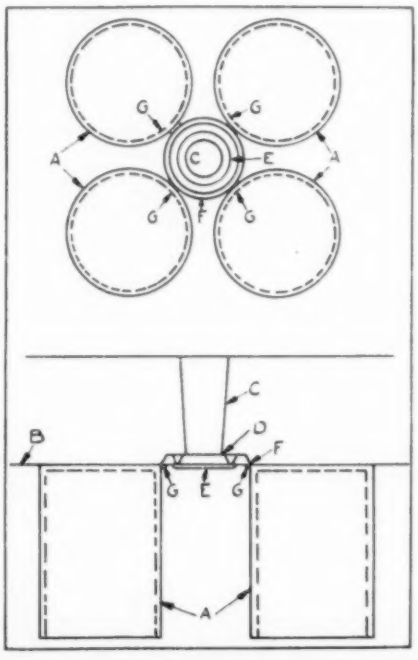


Fig. 93—Each of the Piston Castings Is Fed Through a Small Gate

openings designed to act as gates.

With less skilled men, it might be advisable to place a suitably shaped wood block on top of the cores and ram the sand around the block. When the block is removed a clean basin remains. This feature was touched upon in considerable detail in Parts II and IV of the present series, published in the Jan. 15 and Feb., 15 issues of THE FOUNDRY.

The heater casting shown in Fig.

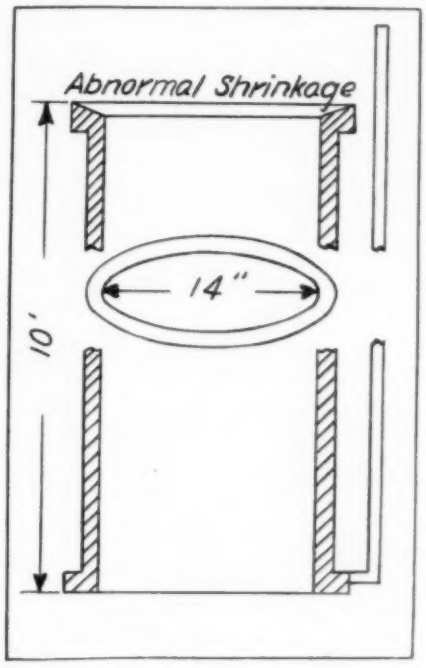


Fig. 92—Strain at the Bottom Causes the Mold To Expand

91 is typical of many castings that leak under pressure at one or more points at the junction of the flange with the body. The mold usually is made in green sand and poured through a gate in the flange.

In all these cases the gate either is the sole cause or an important contributory cause of the defective area in the casting. The gate delivers metal to the flange at the lowest point in the mold and as a result all the metal in the casting has to pass through the flange part of the mold. When the mold is filled, the coldest iron is in the closed end and in the vertical walls. The hottest iron is in the flange. This flange—with machining allowance—is twice as thick as the walls of the casting and, with the added advantage of being filled with hot iron, remains liquid for a greater length of time. The marked difference in cooling time causes some slight segregation at the junction line between the flange and the body and this porous area permits water or steam to leak through under pressure.

Obviously the mold should be filled in a manner to equalize as nearly as possible the cooling speeds of the various parts of the casting. This readily may be accomplished by fill-

ing the mold through a ring of pencil gates located on the closed end and fed from a circular pouring basin. Six ⅜-inch diameter gates will fill the mold satisfactorily.

In some instances the leaky area may be traced to the core. The core is surrounded almost entirely by molten iron and therefore it is essential that the gas should pass easily through the proper channel provided in the drag part of the mold for this purpose. If the iron kicks or flutters from the core, some of the gas inevitably will remain trapped in the iron in the vicinity of the shoulder formed by the junction of the flange with the body of the casting. This trapped gas will form a porous area through which water will leak under pressure. To insure a free vent the core should be made as a shell with a wall not more than 2 or 3 inches thick. It should be made from sharp sand with a minimum amount of binder and baked almost to the point of scorching. A generous opening should be provided in the drag core print and in the bottom plate for the free passage of the gas.

Another form of defect, abnormal shrinkage in the top flange, is shown in Fig. 92. This also is due partly to the style of gate, but due to a greater extent to a yielding mold. On account of the high head, a mold of this kind is subjected to a tremendous static pressure. Where the metal enters at the bottom, it is in a liquid condition throughout the entire length of the casting and therefore in a position to exert this pressure at the last moment, or at the time the column of metal attains its maximum height.

Mold Yields Under Pressure

Where the metal is poured through top gates the pressure on the bottom is not so severe, because usually the metal at the bottom has solidified before the pouring process is complete. However, the pressure is sufficient to distend the walls of the mold if they are not sufficiently rigid. The wall may resist the pressure until the mold is filled, until after the ladle has been taken away. Then it may yield slightly and the result is that the metal in the upper part of the mold will sink down to help fill the increased space. The insidious feature of this type of defect is that it is not apparent to a casual examination. Actual measurement with a pair of calipers will show whether the casting is normal, or, if it is swelled out of shape.

Obviously the proper remedial measure to take is to make the mold either in loam or dry sand and to see that the flask and other rigging are designed and constructed in a manner to resist the pressure of the molten metal in the mold. This rigging feature is even of more importance if the casting is to be made in a green sand mold. A snug fitting flask must be provided, a flask that will not allow the walls of the mold to yield. A number of small pop gates on the top will introduce the metal gently and also will keep it alive on the upward passage and thus prevent cold shuts. This style of gating also will allow the metal on the bottom to set before the mold is filled and thus reduce the strain on the bottom of the mold.

Incidentally it may not be out of place to point out that cold shuts may be due to the character of the iron, to the temperature, or to the manner in which it is poured. Irons vary to a considerable extent and although two irons may be melted under exactly similar conditions, still one will run much more freely than the other. Naturally the sluggish iron must be melted at a higher temperature than the other, poured at a greater speed, or—in some instances—both.

Occasionally a particular casting, particularly one that is finished all over, gives a great deal of trouble on account of defective areas due to dirt that floats into the mold with the metal. If the casting is ordered in large numbers and if the standard style of gating does not prevent this form of trouble, it is advisable to design and apply a special gate.

An example of this kind is shown in Fig. 93, four 5-inch pistons grouped around a central runner and

(*Concluded on Page 56*)

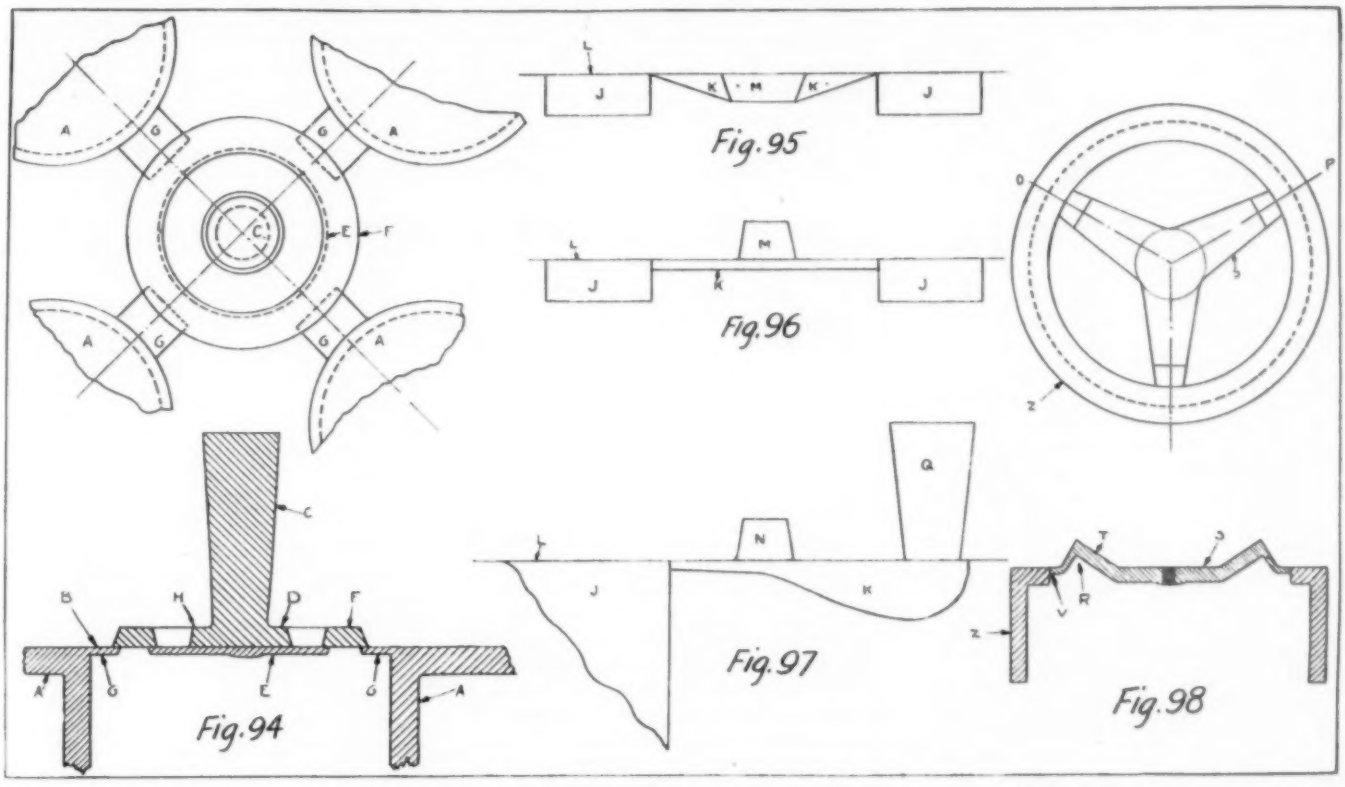


Fig. 94—Enlarged Section and Plan View of the Piston Pattern and Gate Layout Shown in Fig. 93. Fig. 95—Gate and Runner Are in the Drag. Fig. 96—In This Preferred Method the Gate Is in the Drag and the Runner Is in the Cope. Fig. 97—Shows Application of the Dirt Catcher Principle to a Loose Pattern. Fig. 98—A Dirt Catching Spider Gate for an Automobile Brake Drum Casting

Control of Moisture in Blast Reduces Loss in Piston Ring Castings

By Neil A. Moore

ABOUT 7 or 8 years ago, automotive engineers began to decrease the cylinder diameter of automobile motors and to use narrower piston rings. Consequently, piston-ring foundries were called upon to produce much lighter castings than they had been accustomed to make. With the production of these lighter castings, the problem of hard iron became serious. In the foundry of the Piston Ring Co., Muskegon, Mich., it was discovered that the light castings were hard at times and, at other times, with apparently no change in the practice, they were soft and machinable. This condition continued for 2 or 3 years and gradually developed in the minds of the operators of the foundry the conviction that weather conditions, with respect to the moisture content of the atmosphere, constituted an important influencing factor as far as hard iron was concerned.

Air Causes Trouble

Since it was true that clear, dry air gave no trouble, whereas damp, humid air did, it was plausible to expect that there must be an appreciable variation in the amount of water blown into the cupola on the two types of days. An examination of the government weather reports for the district showed that such a variation did occur between a normal winter day and a humid day in the summer. From Table I, it will be seen that 248.1 gallons of water were introduced into the cupola on a humid summer day over and above that blown in on an average winter day. Here was an appreciable difference that could account easily for the variation in the iron from the cupola on the two types of days.

However, before definitely considering that atmospheric moisture was the source of hard iron trouble, every other possible contributing factor was eliminated. Cupola operation was watched closely every heat. The making of the bottom, the lighting and the burning of the bed, the amount of coke for the bed, the method of charging the cupola, all were standardized and held uniform. Pig iron was purchased from reliable sources and each car received was piled separately and analyzed before being used. All materials were weighed carefully and charged by conscientious, dependable men. In making up the pig iron charges, iron was used from at least four different cars for each charge. This was done to minimize the possible bad effect of any off-iron.

When trouble with hard castings occurred, a careful check was made on the cupola operators to see that they were not at fault. Then the pig iron in the charge was juggled. Irons from different cars than had been used were charged. Coke also was taken from a different car. Sometimes one of those changes would remedy the trouble. However, there were many days on which no change in ordinary method of operation, or in pig iron or coke, would help the situation. It was because of that condition that the blame was laid on the moisture content of the atmosphere, since the trouble always was worse on the damp, humid days of spring and summer. During those days it was almost impossible in running the cupola to avoid making a percentage of hard castings, especially on the lighter patterns. It was found that certain steps could be taken to mitigate the trouble, but it could not be eliminated entirely on such days.

During the summer of 1928, the late Dr. Richard Moldenke visited the company's foundry in the capacity of consultant, and convinced the officials that it would be advisable to install a refrigerating system with which to control the moisture in the blast. The system was put into operation the following May, and has been used for every heat taken off since that time.

It must be borne in mind that the castings which are affected are extremely light and have to be machined to close limits. Many of those ring castings weigh less than 1 ounce. It is because of this small weight that ordinarily insignificant changes in the iron will produce, on the one hand, good machinable castings, and on the other hand, hard castings. A description of what was experienced on a day when the moisture content of the air was high will serve to illustrate the effect on the castings produced. Ladle iron would come down just before 7 o'clock in the morning. Shortly after 7, the first molds coming around on the conveyor were poured, and from then on the pouring was continuous.

Blast Is Shut Off

The castings were free from chill until 8:30 or shortly thereafter. Then on the lightest jobs, the edges of the castings, at the back of the ring farthest from the gate, a slight chill would begin to show. The castings all were gated from the outside, at one point around the circumference. Castings with the chilled edges were scrap, as they could not be machined. The immediate remedy was to shut off the blast, bott up the tap hole and allow the iron in the crucible to lay there for 3 or 4 minutes. When the iron again was tapped and poured, the castings were all right. If the moisture content of the air was not excessively high, generally it was possible to get through the day with only a small loss due to hard iron, by repeating the remedy previously cited above, at frequent intervals.

Cooling Unit Used

PRIOR to the installation of a refrigerating unit in the plant of the Piston Ring Co., Muskegon, Mich., that company was troubled with a variation in the metal produced, depending on weather conditions. Castings were chilled along the edges opposite the gate when moisture content of the air was high. On the recommendation of a consultant and after a study of the situation, a refrigerating unit was installed to control the amount of moisture in the blast. The success of the installation, both from the increased number of good castings and the operating cost of the new equipment is explained in this article which is abstracted from a paper presented at the Chicago convention of the American Foundrymen's association. The author is metallurgist, Piston Ring Co., Muskegon, Mich.

However, if the moisture condition was bad, after the cupola had been shut down two or three times that remedy ceased to be effective. Then it was necessary to increase the amount of coke used on a charge. This slowed up melting and disarranged the balance between the metal from the cupola and the molds to be poured, and so was not to be resorted to until the other remedy failed. It also was not a sure cure for the trouble, so the desire to eliminate the cause always was present.

Can Show a Chill

Iron which normally would make a machinable piston ring casting can be made to show a chill if poured into wet sand or if poured through an improper gate. There also are other external conditions that will cause a ring casting to be hard. Temperature of the metal could be mentioned, but experience has shown that, if the iron is right, there can be comparatively wide variations in the pouring temperature without any subsequent effect on the hardness of the ring casting.

Therefore, if iron is poured into a ring mold and chilled castings result, when it is known that the external conditions are correct, the trouble must lie in the iron itself. Something in the iron must hinder the normal dissociation of the cementite into ferrite and graphite, since it is cementite that is present in the chilled portions.

In the opinion of the author, it is oxygen in some form that retards this dissociation. Since the new foundry has been in operation, it has been necessary to line the cupolas to provide a large crucible or reservoir for molten iron. The slag hole always has been 8 inches above the tap hole, and this has allowed the maintaining of a bath of molten iron approximately 8 inches deep in the crucible of the cupola. It has been necessary for this bath to be maintained.

In almost every case where some operating difficulty has permitted the bath to get low, the iron almost immediately stiffens up in the castings, and often castings have started to come hard. Naturally, when the iron has had a tendency to chill, it has been all the more necessary to keep the crucible full of iron. When the iron has been coming soft, a little more variation in the amount of iron in the crucible can be permitted without causing trouble. The author believes that by keeping the crucible full, the molten iron has a chance to lay in intimate contact with hot coke and profit by its deoxidizing action.

Consider the two steps formerly taken to eliminate hard castings on days when excessive moisture content of the atmosphere apparently was causing trouble. First, the tap hole was stopped and the bath of metal held in the crucible with the blast turned off. Here was an opportunity for the molten metal to be deoxidized, since the melting zone was filled with incandescent coke and only a comparatively small amount of air. The gas in the cupola must have been largely CO, and this, along with the hot coke, would act as a powerful deoxidizer. The second remedy was to increase the amount of coke on the charge. Had this been accompanied by an increase in the amount of blast, it would have been a different story; but it was not. It was found that if the blast was increased when the coke charge was increased, the desired results were not obtained. When the coke charge was increased without a corresponding increase in the amount of blast, the melting was slowed and changed the balance between the coke and air. The author believes that this change in the ratio of coke to air, in a way that increased the amount of coke, brought about a condition in the cupola by which the proportion of CO gas was increased, and that this gas acted as a deoxidizing agent and thus served to eliminate the tendency of the iron to chill. That seems to be a point in favor of the theory that oxygen is responsible for the trouble in question.

Oxygen Is in Nascent State

The best explanation of the manner in which moisture in the blast will react, is that when the water dissociates in the presence of incandescent coke into oxygen and hydrogen, the oxygen is in a reactive state and immediately combines with an element or elements in the iron and increases the tendency of the iron to chill. This explanation seems to be the one best suited to each of the different experiences that we have had with chilled castings caused by excessive atmospheric moisture.

Regardless of whether or not the theories regarding the effect of excessive atmospheric moisture in the cupola blast on the hardness of piston-ring castings are correct, the elimination of that excessive moisture has been a success in the foundry of the Piston Ring Co. Hard iron losses have dropped to an almost negligible percentage. Fully 75 per cent of cupola operating difficulties previously encountered, have disappeared. Because of smoother and more accurate control, reductions in the amounts of limestone and fluorspar used and in the amount of coke between charges have been made. These have more than offset the operating costs of the system. It is true that occasional trouble with hard iron has appeared, but in every instance in which it has occurred since moisture control has been substituted, we have been able to trace the trouble to the way the cupola was being run, or to bad coke or off-pig iron. These causes of trouble have been comparatively simple to correct.

Fluidity Is Problem

There are many problems still to to be solved in the foundry, but the moisture control system, by eliminating one variable, has made it easier to distinguish these problems.

Table I

Water Blown into Cupola

	On normal winter day	On humid summer day
Grains of moisture per cubic foot of air	2	10
Total gallons of water blown into cupola in 10 hours (using 3000 cu. ft. of air per minute.)	61.76	308.8

Fluidity is an important consideration. The author believes that fluidity is connected closely with the oxygen content of the metal. It generally is believed that oxidized iron lacks fluidity. This may be true, provided the oxygen content is exceedingly high. However, iron with an oxygen content high enough to cause chilled piston-ring castings is extremely fluid. On the other hand, if the oxygen content of cast iron is reduced below a certain point, the iron will become sluggish and will not run comparatively simple castings.

About 6 or 7 years ago, while running an electric furnace, it was found that the fluidity of the metal showed remarkable variation in a short period of time under certain conditions. The foundry was attempting to run continuously, and would start out in the morning with a cold charge of 3000 pounds. After this was up to temperature, pouring was started. Approximately 500 pounds of iron would be poured every 15 minutes and, immediately after pouring, an equal amount of cold metal would be charged to keep up the bath. By 10 or 11 o'clock in the morning, the furnace would be extremely hot. The bath of metal would be covered with a siliceous slag in which there was some

crushed carbon electrode material.

The iron would be fluid enough to run the ring castings without any trouble. However, if both doors of the furnace were shut and application of the current continued, in less than 5 minutes the iron would lose its fluidity to the extent that it would not run even one-quarter of a comparatively heavy ring. Obviously, loss of fluidity was not caused by the metal cooling off. If, after this loss of fluidity occurred, the charging door was opened, a shovelfull of mill scale thrown in and rabbled into the bath, the fluidity immediately returned. Unfortunately, it was not possible to judge accurately how much mill scale to add, and the result was that the fluidity returned after such treatment but the castings were white hard. Evidently there is a relation between the oxygen content of cast iron and its fluidity, for the fluidity was lost when the condition in the furnace was made highly reducing, and returned when mill scale, or iron oxide, was added to the bath.

However, it was not until later, when connected with the cupola operations, that such a condition arose again and so made the evidence impressive. When the cupola metal was running to the soft side but still was fluid enough to run the castings, that the fluidity could be lost readily by botting up the tap hole and allowing the bath of metal in the crucible to stay there 2 or 3 minutes with the blast off. It may be argued that the temperature of the metal dropped and that this would account for the loss of fluidity, but this was not true. The temperature drop always was too slight to have any effect.

Explains Reasoning

Previously, it has been stated that when the iron was coming hard, the tap hole was botted up and the bath of metal in the crucible allowed to lie there for 2 or 3 minutes with the blast off. This treatment would make the iron soft, evidently by reducing its oxygen content.

For those who may be interested, a short description of our system is included. In the summertime, air is taken from the outside. In the winter, outside air is mixed with air from inside the building, the object being to help control the final air temperature. The two stages of water spray are used whenever they can serve to lower the air temperature. This is mostly in summer, when ordinary water temperature is lower than that of the air.

Brine spray accomplishes the final cooling. Air coming from this spray is kept at a constant temperature. Calcium chloride is used in the brine system and ammonia coils serve to cool the brine. After the air comes from the brine spray, it is passed over steam coils and is heated to room temperature. A second steam coil is located ahead of the blower and here the air is heated to about 150 degrees Fahr. This is accomplished with exhaust steam and helps to keep the tuyeres clean and also slightly increases the cupola efficiency. From there on, the air travels through a positive blower and into the cupola. A temperature of 35 degrees Fahr. is maintained as the air leaves the spray.

Prevent Losses

(*Concluded from Page* 53)

poured through a single gate on each piston, located at the side of the top or closed end of the casting. An enlarged section of Fig. 93 is shown in Fig. 94. The various letters indicating corresponding parts are the same in both illustrations.

The four castings are marked *A*, the parting line *B*, and sprue *C* and the boss in the center on which the sprue rests is marked *D*. Iron from the ladle runs down the sprue *C* and spreads over the thin disk *E*, ⅛-inch thick all over except in the center where a slight depression increases the thickness. After spreading from the center the iron rises in the ring *F*. Any light, foreign material, slag or dirt, remains on top and the clean iron flows into the casting through the gate *G*. Both the corner of the boss marked *H* and the ring *F* act as dirt catchers. In Fig. 94 the parts in the cope are shown cross hatched in one direction while those in the drag are shown cross hatched in the opposite direction. Users of that type of gate report that dirty castings have disappeared since its introduction.

Readers of the present series will recognize the foregoing type of gate as a variation of the *storge* gate, the gate in which an upper chamber is provided for the reception of foreign material. The design of the gate is based on the fact that the specific gravity of the foreign material is lower than the specific gravity of the iron and therefore the foreign material always floats on the top of the stream. Where the stream is checked by a baffle, or where it emerges into a large chamber before it arrives at the mold cavity, the foreign material remains while the cleaned iron flows underneath into the mold.

Another special gate, also taken from automobile casting shop practice is shown in Fig. 98. The brake drum casting *Z* is shown in one cross hatching while the brass gate *S* is shown in another. The sectional view below is taken on the line *O P*. The gate, a brass spider, is well fastened into the pattern so that it may serve as a draw plate. The molten iron rising over the hump *K* leaves any floating dirt in the upper corner *T* before it enters the mold through the thin choking gate *V*. Here again it will be noted that advantage is taken of the same principle, the difference in weight between the molten iron and foreign inclusions.

Place Runner in Cope

In many foundries the custom prevails of placing both gate and runner on the drag side of the matchplate. This may be done through ignorance, through carelessness, or through a penny pinching economical program. Almost without exception the custom of placing runner and gate on the drag side of the plate constitutes an invitation to trouble and never should be done. The proper method and one that is practicable in nearly all instances, is to place the runner on the cope side and the gates on the drag side of the plate.

In special cases, for example where they may be needed to prevent shrinkage, the gates may be placed on the cope side of the plate with the runner, but wherever possible the other arrangement is preferable.

The old method of placing both runner and gate on the drag side is shown in Fig. 95. An improvement in this method by which the gate is placed in the drag and the runner placed in the cope is shown in Fig. 96. In both of these illustration *JJ* indicates two castings. *M* is the runner *K* is the gate *L* is the parting line between the cope and drag with the runner on one side and the gate on the other.

Usually the gate shown in Fig. 96 may be made from 1/16 to ⅛-inch brass or aluminum and is easier to fabricate than the gate shown in Fig. 95. The runner in the cope not only acts as a dirt catcher, but also helps to *hold up* shrinkage, simply a foundry method of saying that the metal in the runner sinks by gravity and compensates for the natural shrinkage of the metal in the casting. Where the gates are cut by the molder, one style presents no more difficulty than the other in the actual cutting.

The precaution of adding a dirt catcher to the runner on an ordinary floor or bench mold may be carried out as shown in Fig. 97. The parting line is marked *L*, and the pattern, sprue, gate and dirt catcher are marked respectively *J*, *Q*, *K* and *N*, The pattern *N* either is placed on the joint a short distance back from the gate entrance or a corresponding cavity is cut in the cope face after the mold is taken apart. Where several gates are fed from a long runner, this dirt catcher may take the form of a long stick on the open side which crosses all the gates as close as possible to the patterns.

This is the eighteenth of a series of articles dealing with the various types of gates and risers used in the foundry industry. The nineteenth will appear in an early issue.—The Editors.

Fig. 10—The Core Room Is Fitted with A Monorail System for Handling Large Cores. Most of the Small Cores Are Dried in Metal Forms To Insure Accuracy

Specializes in Stoves for Seventy-Six Years

By Pat Dwyer

SURFACE appearance plays such an important part in the marketing of stoves and ranges that the character, preparation and application of the sand to the pattern receives the greatest consideration. At one time all the patterns were *printed back*, which means that after a coating of blacking had been dusted over the face of the mold, the pattern was replaced and rapped down gently to smooth the blacking and set it firmly in place. This superfine finish is not essential on castings that later are covered with a coating of enamel. Also the presence of graphite interferes with the success of the process. Therefore, printing or stamping back is omitted on castings that are to be finished in this manner.

Two grades of sand are utilized at the plant of Walker & Pratt Mfg. Co., Watertown, Mass., in the formation of the stove plate molds. Both come from the North river deposits in New York and are known respectively as Albany 00 and Albany No. 1. The grade known as Albany double 0, is an exceedingly fine grain sand and is prepared and applied in a special manner to insure a perfectly smooth face on the casting.

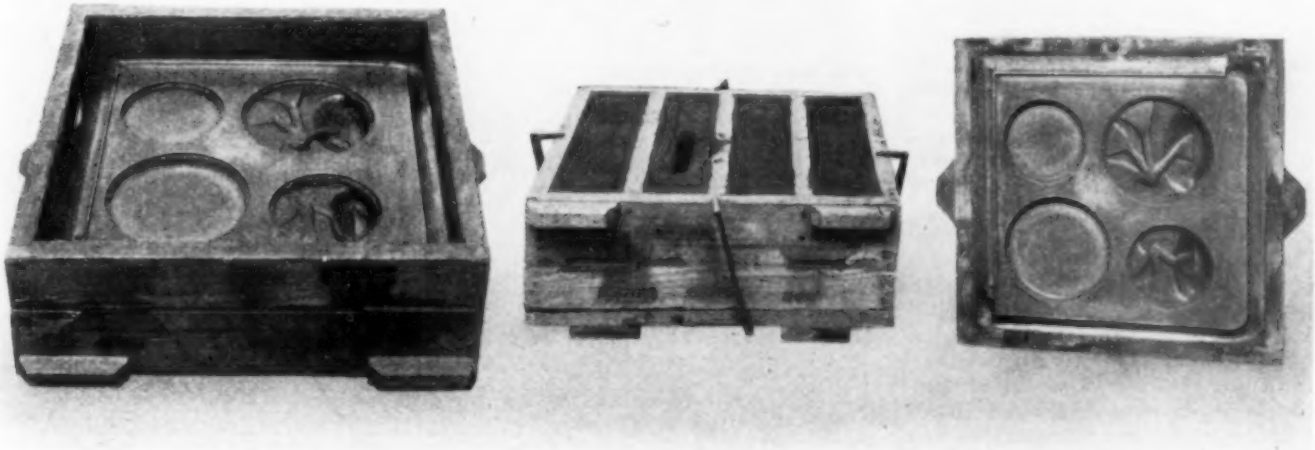


Fig. 11 (Left)—Fine Sand Is Sieved Over the Pattern Face Through a No. 10 Riddle. (Center)—Equipment Weight Is Held To a Minimum, Note the Light Clamps. (Right)—Aluminum Matchplates Are Used for Molding Nearly All the Castings Made in the Stove Shop

First it is thoroughly dried in a device designed and erected by the company and consisting of three steel plate shelves or platforms 4 x 20 feet with suitable piping connected to a small steam generating plant similar to those employed for heating private and public buildings.

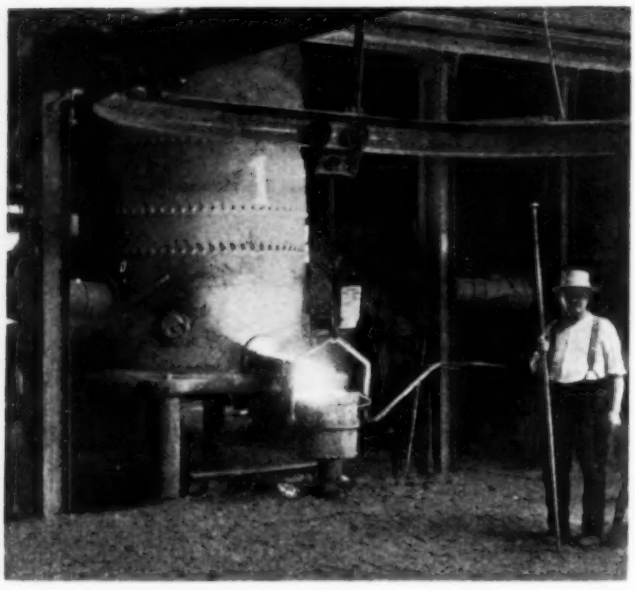


Fig. 12 — Bull Ladles Suspended From a Monorail Are Employed To Distribute the Metal To Various Points in the Foundry

From the drying beds the sand is carried aloft by a bucket elevator and discharged into a grinding mill which reduces the sand almost to the texture of beam dust, that famous old standby of early foundrymen when they wanted to impart a particularly fine finish to the surface of a casting.

Collected on Wood Beams

For the benefit of readers whose experience does not extend back past the modern foundry building with its slim steel roof supports, it may not be out of place to explain that in the comparatively narrow, old time foundry, heavy squared timbers with ends resting on the walls, were employed to support the roof. In extreme instances, the timbers were not even squared or subjected to any other tooling with the exception of being sawed square at the ends. In a Mid-West foundry recently torn down, but formerly prominent in the stove foundry industry since the sixties of the past century, the bark had not been removed from the 10-inch diameter tree sections used for beams and columns.

Rounded tree trunks or squared beams, these wooden members served as collectors of fine dust liberated at the shakeout and sand cutting periods in each day's operation. Steam and hot air carried this fine material aloft in suspension. Later under lower temperature and in response to the law of gravity the material descended toward the floor and naturally the wide beams intercepted and held a considerable amount. In the majority of instances it never was utilized, but occasionally—as previously stated—a small quantity was collected and sieved or dusted over the face of a pattern to insure a more than ordinarily smooth face on the casting made in that mold.

The specially prepared new sand is employed for the same purpose and in the same manner. From the mill it passes through a fine screen and thence into two storage hoppers provided at the bottom with suitable gates. Through these gates the sand is drawn as required into a wheelbarrow and taken into the foundry where it is distributed to the various molding floors as required. The regular sand heaps are renewed as required by the addition of new sand from the second storage bin. The amount varies to some extent from time to time, but the average amount of new sand works out over a yearly period as about 1 ton of sand per 10 tons of castings produced.

Stove plate castings are light and thin and therefore do not impose a severe service on the sand. Facing sand mixtures containing coal dust are not required to prevent fusion of the sand on the face of the casting. The pattern is covered with heap sand passed through a sieve or fine riddle, one with 10 meshes to the lineal inch, or 100 meshes to the square inch. A thicker coating of sand, approximately 1-inch, then is riddled over the face from a ¼-inch riddle. The remainder of the sand then is shoveled into place.

Sand in the molds for heater sections, miscellaneous heavy castings and many small castings in broken lots, is rammed by foot and hand in the manner that formerly obtained in all stove foundries, and still is practiced to a considerable extent. However, the greater number of the molds are produced on a battery of air operated squeeze machines made by the Osborn Mfg. Co., Cleveland, and the Arcade Mfg. Co., Freeport, Ill.

The floor of the foundry building is divided longitudinally by a low partition in the center and by two gangways located midway between the center partition and the side walls of the building. This arrangement provides for four lines of molding floors as shown in Fig. 13. The two outside lines extend from the gangways to the wall. The two inner groups extend from the center line to the gangways on either side.

A transverse central gangway extends from a point in front of the cupolas to the gangway on the opposite side of the building. The monorails suspended from the roof beams follow the lines of the gangways to facilitate the distribution of the molten metal.

Cores Dried in Forms

Cores are made from three grades of sharp sand. One is an exceedingly fine grain silica sand known as Providence river sand and used extensively throughout New England. It is used in small intricate cores. The second grade of sand is a little coarser and is used for a general line of cores in which permeability is not the most dominant factor. The third and coarsest grade of sand is employed in the construction of large cores, particularly the cores for boiler sections and other castings of a similar size and character entering into the construction of steam, hot air and hot water heating units for public and private buildings. The sands are mixed with an oil binder and prepared for use in a pair of revolving paddle type mixing machines made by the Blystone Mfg. Co., Cambridge Springs, Pa.

To prevent distortion during the drying period, most of the cores are dried in cast iron forms, approximate duplicates of one-half of the corebox. A description of the equip-

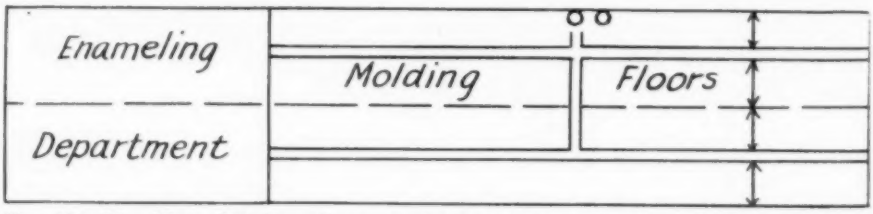


Fig. 13—The Main Molding Floor Is Divided Into Four Longitudinal Sections with the Cupolas At One Side and the Enameling Department at One End

ment and method employed in forming the core for a gas burner casting, applies with or without minor modifications, to the others. The equipment includes two half coreboxes, right and left, a vent plate and a number of dryer shells. The number, of course, depending on the number of castings required to meet any given daily production schedule.

One half the corebox and the vent plate are shown in Fig. 16. Sequence of operation, reading from left to right and down in the usual manner, is shown in Fig. 15. Thus in the upper illustration the right and left half coreboxes are shown filled with sand and with the vent plate pressed into place on the right half. This plate as shown in Fig. 16 conforms to the shape of the corebox and is provided on the face with a small rib, semicircular in cross section, which forms a corresponding identation in the sand when the plate is pressed down. Lugs and pin holes on the vent plate guide it accurately into place and insure a continuous vent channel in the center of the joint of the main part of the core and its branches. Briefly it may be said that this method of forming a vent channel in the core takes the place of the primitive, but still widely practiced custom of scratching a channel in the face of a dried half core with an old file, or, in the joint face of a green half core with the corner of a trowel or the point of a double ender.

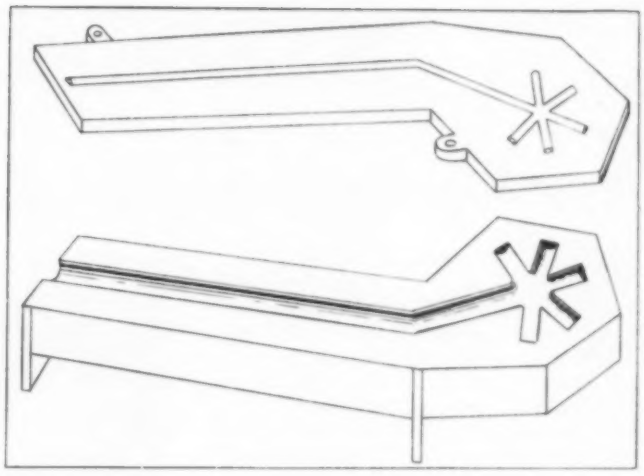


Fig. 16 — Conventional Presentation of Corebox and Vent Plate for Gas Burner Core

Dried in Shell

After removing the vent plate, the two half coreboxes are brought together face to face and then rolled back so that the part *R* rests on the part *L*. The part *R* then is rapped and removed and replaced by the dryer shell. The entire assembly once more is rolled over and the part *L* of the corebox is removed. The complete core now rests in and is supported by the dryer shell and in that condition is placed in the oven where the core is dried. The two half coreboxes are placed on the bench, as in the first position, and the sequence of operation is repeated as often as necessary to meet the day's requirements of cores.

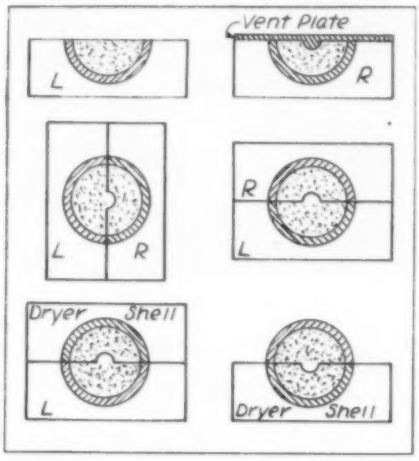


Fig. 15—Illustrating Sequence of Operation in Preparing a Small Core for the Oven

Despite the innovations of electrically driven equipment in many parts of the plant, two departments still are energized from the steam power plant installed when the foundry was built about 30 years ago. One department includes the batteries of tumbling barrels belt driven from the main shaft leading from the engine room where power is supplied by a corliss type steam engine.

Driven by Steam

The second department includes the cupolas, each one supplied with air by an individual rotary pressure type blower made by the P. H. & F. M. Roots Co., Connersville, Ind., now a division of the International-Stacey Corp. Each blower is driven directly by a small upright type steam engine. To all intent and purpose the apparatus is as satisfactory now as it was when installed and barring a major upheaval, probably will continue to function for as long or perhaps a longer period in the future than it has in the past.

Engines and blowers are located in the engine room with the main engine, pumps and compressors and thus come under the jurisdiction of the highly skilled mechanic who presides over this highly ordered jungle of whirling wheels and darting, shining piston rods. Although located adjacent to the foundry building, the engine room is effectually walled off and insulated. Sand, dust or grit do not enter to interfere with lubrication, score the bearings or cause a short circuit in the bearing, action and language of the engineer.

On account of the relative location of the engine room and the cupolas, the air has to be driven a distance of 60 feet before it enters the near-

(*Concluded on Page* 65)

Fig. 14—Long Stove Legs Are Molded in a Snap Flask From Aluminum Matchplate Equipment Mounted on a Squeeze Machine

STEEL FOUNDERS Consider Policy of Firm Bidding

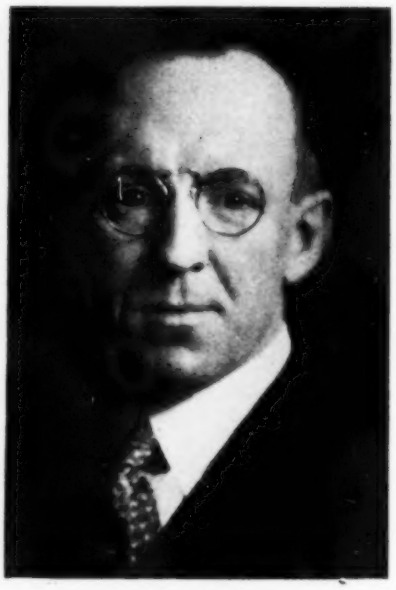
A COMBINED session of the light and heavy castings branches of the Steel Founders' Society of America at the afternoon session held in Chicago, Sept. 17, considered the merits of firm bidding as a principle conducive to better conditions in the industry.

Arthur Simonson, Falk Co., Milwaukee, presented a complete review of the merits of firm bidding with T. H. Harvey, Ohio Steel Foundry, Lima, O., presiding over the discussion that followed. This principle, which obligates sellers to submit one bid and to refrain from changing this bid unless subsequent changes in the buyers' specifications require, has had wide discussion and the speaker gave full credit to M. W. Nichols, Allis Chalmers Mfg. Co., Milwaukee, W. E. Farrell, Eastern Car & Construction Co., Easton, Pa., and Robert Gaylord, Ingersoll Milling Machine Co., Rockford, Ill., for much constructive work given to advancing this sales practice.

The principle was suggested first as a remedy in the era of profitless prosperity. The measures proposed have been fostered in large measure by the National Machine Tool Builders association, and have been accepted in district meetings of the National Association of Purchasing Agents and a resolution supporting the practice, both in selling and buying, has been adopted by the machine tool builders.

The single bid rule has been approved by the Federal Trade commission at a trade practice hearing of the fabricators of reinforcing steel, and as such has been removed from any stigma of price fixing. Various other associations have had the matter under consideration. The definition of the firm bidding practice, as promulgated by the machine tool builders is as follows:

"The submission of a price accurately determined with reference to cost, to remain unchanged unless a change in buyers' specifications warrants a different quotation."



Arthur Simonson

After an active discussion, a motion by S. W. Utley was adopted referring the resolution shown in the accompanying box to the membership of the Steel Founders' society, with the object of bringing the matter to vote at the December meeting. Considerations of sales policies and practices featured the all day session of the society.

W. H. Worrilow, Lebanon Steel Foundry, Lebanon, Pa., in his opening address as president, stressed the idea of improved sales practices. A preconceived plan of sales was urged with attention to the future value of such a plan in the period of business recovery.

Granville P. Rogers, managing director, presented his report at the morning session, developing the work and accomplishments shown under the 57 distinct services offered by the society to its membership. Homer J. Buckley, Buckley-Dement & Co., as luncheon speaker, recommended compilation of selected lists of prospects, stating that a study of buyers' interest is necessary in the period of economic recovery. He stated that personal selling, unsupported by education work leads to prohibitive sales costs.

Maj. R. A. Bull, Electric Steel Founders' Research group, Chicago, presented a detailed technical discussion on the properties of steel castings which should be known to all steel foundry salesmen. He stated that no steel foundryman is thor-

Resolution Referred to Members for Discussion

WHEREAS, the practice of manipulating bids as between buyers and sellers reduces a sound business negotiation to the hazards of common gambling; invites confidential information for the purpose of procuring price advantage; wastes time and energy and encourages price cutting at the expense of fair dealing and honest values—all detrimental to the public interest; and

WHEREAS, firm bidding precludes any suggestion of price fixing by the seller or any prospect of price revision in the mind of the buyer, and will logically result in more accurate cost estimates, improved quality of product, increased plant efficiency, maintenance of wages and conditions of work at a satisfactory level, with lower prices to the consumer—highly legitimate considerations in the public interest; now, therefore, be it

RESOLVED, that the Steel Founders' Society of America shall and it hereby does endorse the principle of firm bidding; further,

RESOLVED, that the members of the Steel Founders' Society of America will instruct their purchasing agents to adopt the practice of open prices and the receiving of firm bids in the conduct of their departments, and to use their influence in securing, through their associations and otherwise, the approval of the principle of purchasing agents generally; and further

RESOLVED, that this resolution be presented to the National Association of Purchasing Agents, urging the latter to approve the principle and assist its practice by open bidding instead of the secret bidding now in vogue.

oughly familiar with all the characteristics of metal capable of being manufactured in his plant. Probably every week, steel castings are being manufactured in the country, intentionally covering the wide range from 50,000 to 200,000 pounds per square inch tensile strength, having yield point, elongation, reduction of area, fatigue, impact, hardness and other values establishing the ability of the material to meet almost every condition in consuming industries. He presented comparative data on steel castings and competing materials in various types of service.

R. F. Nash, Pettibone-Mulliken Co., Chicago, in presenting the report of the cost committee of which he is chairman, announced the preparation of a standard form of estimate sheet.

Business among steel foundries according to individual members reports was at a low ebb in August, with the average rate of operation at about 25 per cent. Among the 50 members present, representing about half the member firms, many reported inquiries better, with seasonal demand serving to strengthen the fall outlook. In eastern sections, activity in textile trades has brought improvement. In the automotive regions, although orders are not appearing, pattern shops are busy. Similarly in the Chicago district, member firms operating patternshops report full time operation on new patterns and changes in design npon existent equipment for which orders have not as yet been placed.

Publishes Article on Foundry Progress

C. O. Bartlett & Snow Co., 6200 Harvard avenue, Cleveland, recently published in booklet form an interesting paper by Arnold Lenz, general manager, Gray Iron Foundry, Chevrolet Motor Co., Saginaw, Mich. The paper, which was presented at the 1931 spring convention of the Michigan Engineering Society, is entitled "Foundries Are Keeping in Step." The booklet is well illustrated with reproductions of photographs of various types of equipment used in transporting materials in the Chevrolet foundry.

Repairs Steel Flasks

A cast aluminum attachment shown in Fig. 1 of the accompanying illustration has been developed and applied to warped and twisted steel flasks in the nonferrous department of the Stromberg Carburetor division of the Bendix Aviation Corp., South Bend, Ind. One of these castings is riveted to each end of the flask. It is reinforced with vertical and transverse ribs and is equipped with a guide lug and a handle. The guide lug at one end supports a pin and the guide lug at the opposite end of the flask is fitted with a hardened steel bushing. This, of course, is in accordance with ordinary practice. The distinctive feature of the device is the hardened and threaded steel stud *A* inserted as shown. This stud at each of the four corners of the flask may be adjusted to secure a perfect four point bearing for the edge of the flask on the pattern plate or on the

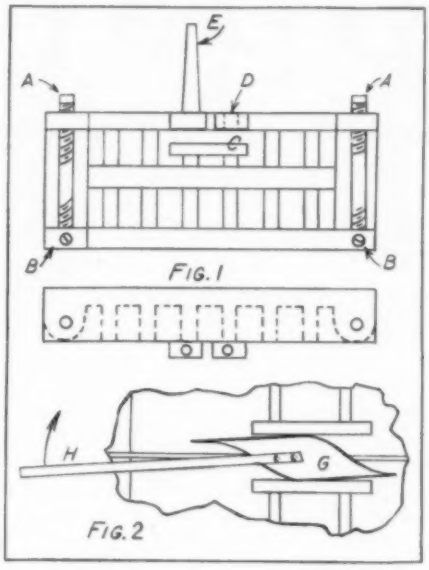


Fig. 1—The Studs A A May Be Adjusted To Secure a Four Point Bearing on the Joint—Fig. 2—Below—Leverage Exerted at H Will Separate the Cope and Drag

table of the molding machine. A set screw *B* holds the stud in position until and if another adjustment is necessary. The device is particularly applicable on stripping plate machines, where it is essential that the stripping pins shall engage the flask uniformly.

An interesting shop kink employing a handy device for separating cope and drag when the pins show a tendency to stick, is illustrated in Fig. 2. A piece of ¼-inch steel plate cut to the shape *G* is riveted to a handle *H*, ¼ x 1½ x 15 inches. By inserting one of these devices between the handles at each end of the flask, the parts may be separated uniformly, steadily, slowly and without jerk or jar.

G. I. Institute Publishes Eighth Bulletin

The Gray Iron institute, Terminal Tower building, Cleveland, recently published its technical bulletin No. 8 containing a discussion of manhole frame and cover, articles on gray iron for manhole frames and covers, gray iron vs. welded structures, and the present position of physical tests for cast iron, the latter being a paper presented to the Gray Iron institute by John Shaw of the international cast iron test bar committee.

Book Review

Gmelins Handbuch der Anorganische Chemie-Eisen, Teil B, Lieferung 4, paper, 216 pages, 6¾ x 10 inches, published in German by Verlag Chemie, Berlin Germany, and supplied by THE FOUNDRY, Cleveland, for $9.15

This volume is the fourth and concluding section of Part B of Gmelin's *Handbook of Inorganic Chemistry* which relates to iron. The first to third sections describe the various combinations of iron with elements such as oxygen, hydrogen, nitrogen, fluorine, etc., and this volume describes the divalent iron salts of divalent iron cyanides; trivalent iron salts of divalent iron cyanides, and divalent iron salts of trivalent iron cyanides. It also includes data on the water insoluble and water soluble Berlin blues; trivalent green iron salts of trivalent iron cyanides, sulphocyanates, and the combinations of iron sulphocyanates with organic materials.

A chapter on iron and silicon describes the divalent iron silicate system; trivalent iron silicate; iron silicofluoride and iron silicon-chloride. The various combinations of iron and phosphorus are given in another chapter and chapters are devoted to iron and arsenic; iron and antimony, and iron and bismuth. The book closes with a chapter of 86 pages devoted to information on typical general reactions of iron salts with inorganic and organic materials.

Operates 70 Years

Although seventy years of age, the W. C. Ellis & Sons Iron Works, Memphis, Tenn., apparently is more vigorous and virile than at any time in its long history dating back to 1862. The plant now occupies the entire block bounded by South and Front streets, and Linden and Clinton avenues and still is under the direction and personal supervision of members of the Eilis family, sons of the founder W. C. Ellis. W. J. Ellis is president and Henry C. Ellis is vice president and general manager. The present business depression has touched the company but lightly. The plant is operating with practically a full force on the manufacture and repair of machinery for oil mills, dredges, cranes, road building devices and others of a miscellaneous character.

Sterling Adds to Line

Sterling Wheelbarrow Co., West Allis, Wis., manufacturer of steel wheelbarrows, foundry flasks and similar products, is adding several new lines, according to H. H. Baker, secretary. It is about to start the manufacture of core plates and bottom boards and the flask line is to be extended to include larger sizes.

Questions & Answers on FOUNDRY PRACTICE

THIS department covers all problems relating to metallurgical, melting and molding practice encountered in making steel, malleable-iron and gray-iron castings. Questions submitted by bonafide subscribers to this department will be answered by members of the editorial staff of The Foundry, supplemented where occasion requires by the advisory staff whose personnel is as follows:

John H. Hall
Cast Steel

H. A. Schwartz
Malleable Cast Iron

J. W. Bolton
Gray Cast Iron

All questions must be addressed to the Editor, The Foundry, Penton Building, Cleveland.

GENERAL

Repair Casting Defects

We would like to know whether any welding is being done on 18 and 26-inch cast iron boiler sections commonly used for heating homes. If they are being welded, are they preheated before welding, and is the electric or gas welding process employed?

As far as we know welding of boiler sections, such as you mention, is not practiced as a part of the foundry production methods. Defective castings that can be repaired by plugging with extremely small soft iron plugs which are peened into place, are given a second water test. If seepage is not evident at the plugged place under a 100-pound per square inch pressure, the casting is accepted as a good casting.

It is possible that welding could be employed, but usually when a defective casting cannot be repaired as mentioned, it generally is found that the defective portion is too widespread to make it worthwhile. If you desire to try welding, it will be necessary to preheat the casting to prevent cracking. After the welding operation is finished, the casting must be cooled slowly for the same reason. We believe that either method of welding may be employed after the proper technique for each has been developed.

Q & A

Engine Frames Crack

Recently we cast a pair of gas engine frames 20 feet in length and with a metal thickness in various sections ranging from 1¼ to 2¼ inches. Calculated analysis of the mixture was: Silicon 1.80 per cent, sulphur 0.07 per cent, phosphorus 0.55 per cent and manganese 0.52 per cent. Actual analysis as reported by the laboratory showed: Total carbon 3.49 per cent, silicon 1.66 per cent, sulphur 0.08 per cent, phosphorus 0.49 per cent and manganese 0.61 per cent. We used 10 per cent steel scrap in the mixture. One frame showed a faint crack on the bottom rib. The other cracked on the side for a distance of about 20 inches, but not along the length or depth of the frame. The castings were removed from the sand two days after they were cast. The weather was chilly at the time and they were exposed to a draft and I claim that this treatment was responsible for the cracks. I shall appreciate your opinion on this point and also on the composition of the iron. The cracks only developed after the castings were stripped.

Iron conforming either to your calculated or actual analysis or to any figures within the range shown, should prove satisfactory for large gas engine frames. After a casting in which the greatest metal thickness is 2¼ inches, has remained in the sand for 2 days it has cooled to a point where subsequent slow or rapid cooling will not affect its physical characteristics. If inherent strains are present, the casting will crack before or shortly after it reaches atmospheric temperature irrespective of whether it is left in the mold for a month or stripped after it has passed the bright red stage. The contraction strain set up in a casting 20 feet in length and with the interior filled with rigid dry sand cores is enormous. We assume the mold was made in dry sand, or the face was heavily skin dried. That factor also must be taken into consideration as offering resistance to normal contraction. In our opinion, based entirely on the meager data submitted, the cracks are due to faulty molding or coremaking practice in which proper provision was not made for easy and rapid contraction of the casting in all directions, length, breadth and height.

GRAY IRON

Physical Requirements

What are the standard requirements of tensile strength for light, medium and heavy castings, and the standard requirements of transverse strength? Are there any brinell requirements on castings?

There are two specifications covering gray iron which have been adopted by the American Society for Testing Materials and the American Foundrymen's association. One relates to gray iron castings under the designation A48-29 with the following minimum values for transverse strength obtained from the standard arbitration bar tested on 18-inch centers: Light—1500 pounds; medium—1750 pounds, and heavy—2000 pounds. The deflection in all cases must be 0.20-inch minimum. The minimum tensile strengths when specified shall be: Light—18,000 pounds per square inch; medium—21,000 pounds per square inch, and heavy—24,000 pounds per square inch.

The second specification relates to high-test gray iron castings and is designated A88-29. Some revisions have been made in that specification, and these will be incorporated in the latest publication. The new revised specification will call for a minimum transverse load of 2500 pounds at the

center of the standard bar tested on 18-inch centers with a deflection of at least 0.24-inch. When tension tests are desired the specimen shall show a minimum tensile strength of 33,000 poundsd per square inch. No classification is made on light, medium or heavy castings. As far as we know, there are no brinell specifications except those that may be imposed by the purchaser.

Q & A

Makes Iron Machinable

We use a light form or chill in making a special casting and wish to machine or slot the casting. Can you suggest a suitable mixture that will give machineable or soft castings with the chill?

Since you do not give the size or metal thickness of the casting you intend to make in the chill, nor the thickness of the chill, it will be difficult to supply a satisfactory answer. It may be possible to attain the desired results by removing your present castings from the chill as soon as the metal has solidified, and allow them to cool slowly. Another method would be to anneal the castings in a furnace heated to 1400 degrees Fahr. or slightly above, and holding at that temperature until all parts of the casting attain that temperature. Allow the castings to cool slowly.

The only other suggestion we can make, lacking information as previously indicated, is to increase the quantity of silicon in the castings gradually until you obtain the desired softness. If you only have a few castings to make, you can accomplish that by additions of finely powdered ferrosilicon to the ladle of molten metal. The metal should be as hot as possible, and it may be worthwhile to get the ferrosilicon red hot before adding to the ladle. After adding the ferrosilicon, stir the metal well and pour at the desired temperature, if the metal already has not reached that point.

Problems in Nonferrous Founding

By Charles Vickers

Is Melted Under Oil

We are remelting cadmium anodes that are badly corroded from galvanic action and we would like to be advised what flux or reducer should be used in melting.

When cathode cadmium is melted into the sticks the operation is done in two stages, which we believe you will have to imitate. The first stage is melting under oil of high flash point, as cylinder oil such as 650 W which will melt without excessive oxidation of the cadmium. About 2 quarts of oil are required for 200 pounds of metal. The oil is heated in the pot until a white smoke begins to come off, then the cadmium is slowly slid in and forms a bath under the oil, which slowly carbonizes and evaporates. When all the cadmium is melted most of the oil will be gone, and the cadmium is dipped out and poured into large ingots.

Possibly the metal at this stage will be pure enough for your particular purpose, but if not it will have to be remelted, this time under caustic soda. About 1½ pounds of the alkali is first melted, then an ingot of cadmium is stood on its end in the caustic, and it melts down from contact with the hot pot and slides under the caustic without much oxidation. After the first ingot is melted the rest melt more quickly The molten cadmium is dipped out of the pot, the caustic being skimmed back while the ladle is being dipped. It must be kept in mind that a double melting is necessary in case the metal yielded by melting under oil is not fine enough. From this pot the cadmium must go to ingot molds, not to the caustic pot in the molten condition, but as ingots. That is the reason why thin material and broken little pieces must first be melted under the oil, which must not be allowed to catch fire. Cadmium melts at a low temperature and it should be kept from getting unduly heated.

Q & A

Has Brown Splotches

We are making small castings, that are shaped like a half bearing. Each has two comparatively heavy lugs on each side by which they are bolted down to hold a shape like a shaft in place. Each lug has a hole in it for the bolts, and the holes are well tapered to leave their own green sand cores without difficulty. Owing to the holes in the lugs the castings are cast back up. Our difficulty is caused by brown blotches and a speckled appearance of the fracture when a casting is broken in two through the bearing part, as we may term it. Can you give us the cause and the remedy for these splotches, and advise us in what way they effect the quality of the casting. We would also appreciate you giving us your opinion on the appearance of this metal in reference to grain structure, etc. The piece is part of a connector for electrical work. The requirements of such connectors are conductivity, strength and elasticity. Do you think 88-10-2 *bronze is suitable for this, or what alloy would you recommend?*

These brown splotches are caused by segregation, which in turn is due to a drainage of a portion of the alloy to a place lower down. The highest part of the casting has fed the lowest part, the action taking place before the inner portion solidified. The phenomena is the same as that occurring in a casting of a car journal bearing cast back up. When they are broken the fracture often shows a large brown area, known as a *copper spot*, and it indicates that a portion of the metal, richer in the white alloying metals than the main alloy, and consequently of lower melting point, has seeped away to the sides of the arch lower down. In a bearing the writer is skeptical of those spots doing harm, provided the skin of the journal was cut down to the porous place at one point, to permit the oil to fill the space from which the eutectic had drained, and thus form a well lubricated reservoir.

In the case of these electrical castings, the brown splotches impair the strength of the castings. Test bars carrying brown and discolored areas in their section are always weak. To avoid these heavy feeders are put on the bars and are connected with gates extending the entire length of the test bar. This could be done in the case of these connectors by gating them into the highest part, and putting a little shrink ball at the juncture of gate and casting. However the shrink ball must not set before the casting, otherwise, the condition likely will be aggravated. It is a good thing that these internal shrinkages can usually be stopped by easier methods, such, for instance as superheating the metal in the furnace, then afterward cooling to pouring temperature.

Some metallurgists imagine they can make a perfect alloy, by simply bringing a new alloy to liquidity suitable to flow the castings, then quickly remove it from the fire, whereas the heat has been insufficient, and not long enough continued, to blend the constituents of the alloy, or expand the molecules so they will blend perfectly. Try a little superheat, and if that does not work well, pour at a little higher temperature. If you could lift the green sand cores in the cope, the heavier part around the lugs would feed the back, making it sound, and the gate in turn could be adjusted to feed the lug.

For these connections we would favor an alloy of 90 per cent copper; 6½ tin; ½ lead; and 3 zinc which was found by Staley and Karr to be the most satisfactory alloy of 9 bronzes which they examined. Another good alloy is 88 copper; 8 tin; 4 zinc; which probably would cast minus the defects mentioned above.

Casts Heavy Ingot Mold In Canadian Shop

WHAT is claimed to be the largest gray iron casting made in any Canadian foundry, an ingot mold casting weighing 60 tons, recently was cast in the foundry of the Dominion Steel & Coal Corp., Sydney, Nova Scotia.

Fig. 1—Inside Diameter of This Ingot Mold is 72 inches, Outside Diameter 96 inches

It is octagonal in shape with fluted sides and designed to form a steel ingot 72 inches across the corners and weighing approximately 45 tons. The outside diameter of the mold is 8 feet and the average thickness of the walls is 12 inches.

A total of 12 days elapsed from the time the pattern was started until the mold was ready for the metal. A complete pattern was employed to form both the inside and outside of the mold. The inside or core was erected directly on the drag and was not disturbed. The outside part of the mold was made up of a cheek in two sections, and a cope. The various parts were dried for 3 days and then reassembled in the casting pit.

With the exception of a few lifting plates to carry the sand in the cheeks and a rectangular plate *A* to serve as a connection between the middle and top sections of the lower cheek, all the flasks and other pieces of equipment were selected from that already in existence. The drag and lower part of the cheek flask were 11 feet square. The remaining flask parts measured 10 x 10 feet.

The pattern was centered on a sand bed rammed and finished flush with the joint line. The sand on the outside of the pattern was rammed in the usual manner. A second parting was made half way up and a third parting made at the top. A sprue 3 inches in diameter was formed in one corner of the mold with three gates, one at the bottom, one in the center and one at the top, to lead the metal into the mold. A second gate was formed directly on top of the mold cavity and in line with the first. In Fig. 2 these gates are marked No. 1 and No. 2 respectively. Both these sprues were plugged until the pouring basin was filled with molten iron. The plug from No. 1 was removed first and approximately half the total amount of iron required was allowed to run through that gate. Then the plug was removed from No. 2 gate and the remainder of the iron flowed into the mold through both gates.

The core which was built directly inside the pattern was supported by six crabs or arbors equally spaced and with studs or standards between each pair. A long bolt extended from below the drag to a point about 6 inches above the top of the pattern. It was enclosed near the top in a perforated 8-inch pipe which in turn rested on the top arbor. A washer was placed over the end of the pipe and the bolt was drawn up tight. Two short pieces of light rails were placed under the washer and over the top of the pattern to hold the pattern and core in place, while the crane was lifting the cheeks from the outside of the pattern.

Half a long roll flask was pressed into service for a runner basin. It was lined with sand and dried. Two holes were left in the bottom to correspond approximately with the two sprues in the mold. With this runner basin in position, a block core with a 3-inch hole in the center was adjusted in place over each sprue. Sand was packed around the block and the surface in the vicinity was slicked off to correspond with the remainder of the basin bottom.

To facilitate pouring the metal with two cranes, the mold was set up in the

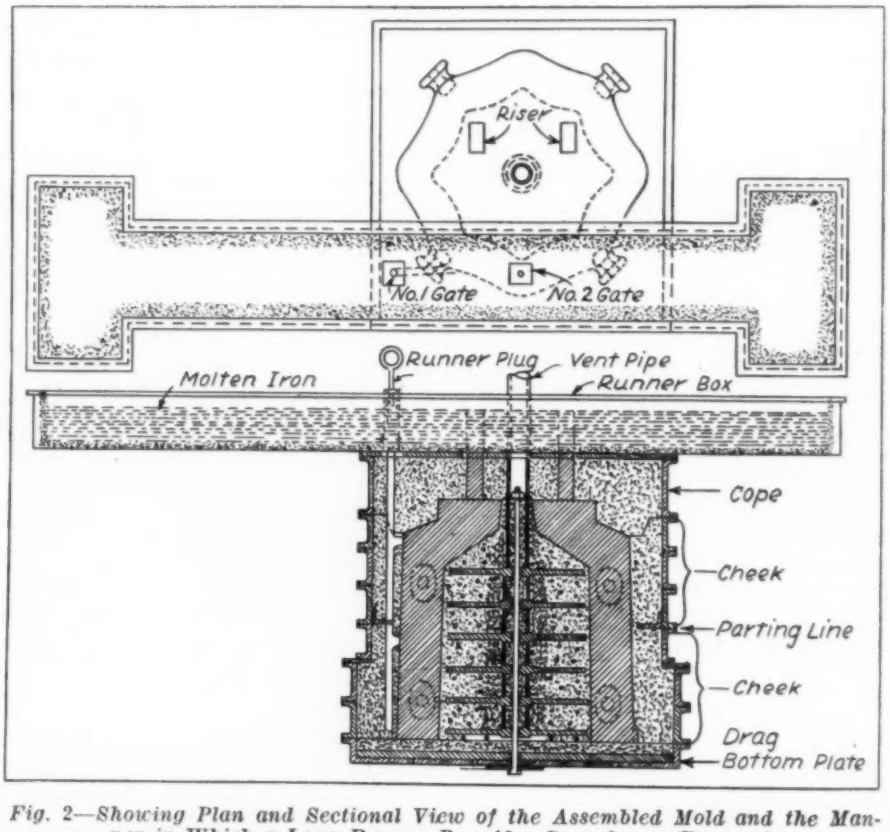


Fig. 2—Showing Plan and Sectional View of the Assembled Mold and the Manner in Which a Long Runner Box Also Served as a Reservoir

casting pit with the long runner basin in line with the row of columns supporting the crane runway. In this manner with the crane trucks touching, the ends of the runner basin were approximately 22 feet apart. This runner basin with a capacity of about 13 tons served as a reservoir and elastic link in the cycle of operation incidental to handling four ladles with two cranes.

Pig iron to the extent of 154,000 pounds was melted in two cupolas in 3½ hours. One of the cupolas is lined to 60 and the other to 48 inches. The total charge was divided approximately 2 to 1, since one cupola melts twice as fast as the other. Four ladles were employed to pour the metal into the mold; two 25,000 pounds capacity, one 35,000 pounds and one 60,000 pounds capacity. The 60,000-pound ladle was suspended from No. 1 crane at the south end of the runner box, the right end as shown in Fig. 2.

Iron from one of the 25,000-pound ladles was poured into the runner basin from the north end, while the ladle was suspended from No. 2 crane. This ladle then was dropped and the second 25,000-pound ladle was picked up quickly and a stream of iron again directed into the basin which still contained the metal from the first ladle. The stopper was pulled from No. 1 gate. When the second ladle was emptied, a stream was started from the 60,000-pound ladle to keep the runner basin filled, until No. 2 crane could discard the empty ladle and pick up the 35,000-pound ladle. The change was made in 50 seconds. At this stage the stopper was lifted from No. 2 gate and the metal flowed more rapidly into the mold. The entire pouring operation occupied 12 minutes. The over iron was distributed among various molds constituting the regular day's work in the foundry. The casting was allowed to cool in the mold for 7 days and then was stripped and cleaned, a first-class casting in every respect.

Suggests Classification

(*Concluded from Page* 50)

If the limitations suggested should be acceptable, there would be identified automatically as belonging to an alloy grade, foundry steel intended to contain less than 0.50 per cent or more than 0.90 per cent of manganese; less than 0.20 per cent or more than 0.70 per cent of silicon; more than 0.05 per cent of phosphorus; more than 0.06 per cent of sulphur; or an appreciable proportion of any element other than the five enumerated.

It also is proposed that steel foundrymen consider classifying as a simple alloy steel, any steel intended to contain no more than the five ordinary elements, but carrying with respect to one or more of these elements other than carbon, a percentage either less than the limitation previously suggsted or more than the one previously suggested, but not exceeding 3.00 per cent.

Carrying the idea still further, some benefit might accrue by considering material as a low alloy or a regular alloy steel, when it is intended to contain an appreciable proportion of some element other than the five ordinary elements, provided the proportion of nickel does not exceed 5.00 per cent; and of any element other than nickel 3.00 per cent.

Continuing the suggested line of thought, there might then be classified as a high alloy steel, steel containing more than 5.00 per cent of nickel, or more than 3.00 per cent of any other element. In such case, austentic manganese steel would be graded as a high alloy steel, whereas now many think more or less restrictively of the chromium and nickel combinations, in speaking of the high alloy materials.

Classifications Are Considered

A general agreement along the lines suggested, but not necessarily following the limitations that are proposed for consideration rather than for adoption, would establish five grades, two of them being of the carbon classification, whose names and chemical compositions, if wisely chosen and widely recognized, would serve useful purposes in some purchasing industries as well as in our own industry. The names of the grades presented herein for discussion are (a) regular carbon, (b) special carbon, (c) simple alloy, (d) low or regular alloy, and (e) high alloy.

It is quite probable that agreement will be easier to bring about in respect to the number of grades or varieties than in respect to names to be assigned to them, and more particularly, in respect to all the chemical limits suggested. The author would emphasize the fact that he advocates agreement only regarding some logical grading method as regulated by an appropriate chemical composition plan.

In commerce a term is useful if, by virtue of its nature or by the result of adequate publicity, it becomes self-indicative to those interested in sale or in purchase. Selections of terms and limitations to apply to material described by the terms become matters of good judgment, to be exercised by those most conversant with the commodity under consideration.

Specializes in Stoves

(*Concluded from Page* 59)

est cupola through two branch pipes. The branch pipes discharge into a windbox which encircles the cupola for a height of 4 feet above the bottom plate. Air from the windbox enters the cupola through a continuous row of tuyeres 6 inches high and located 24 inches above the sand bed. Additional air enters the cupola through an auxiliary set of tuyeres 5 x 6 inches, 2 feet apart and located 14 inches above the lower set.

The cupolas are lined to a diameter of 60 inches throughout, except at the tuyeres where the lining is contracted to a diameter of 50 inches and continues at the lesser diameter to the bottom. For heats up to 30 tons and running 2 hours or less, it has not been found necessary to slag these cupolas. It is claimed that the ring or ridge of solidified slag marking the lower edge of the melting zone can be removed by the cupola helper in a few minutes on the day following the heat. "Hardly worth minchining" according to Martin highly accomplished cupola operator, on the job with Walker & Pratt for the past 45 years. A well worn horse shoe attached above the charging door of each cupola may or may not be responsible for this excellent showing. Martin is discreetly silent on this point.

The cupolas are used alternately. A small cupola is held for emergencies and for melting special heats. All three are served from a common charging floor on which the charges are assembled on small trucks. In the covered storage building referred to previously a narrow gage track extends past the various piles of pig iron and scrap. The small trucks or buggies are loaded by hand and weighed on a track scale located at the junction point where the loaded trucks are diverted to the track leading to the cupola elevator.

Starting the Fire

Preparation and operation of the cupola has been developed to a fine art as evidenced by the method of starting the fire. Instead of throwing in a miscellaneous assortment of scrap wood on top of the shavings or oily waste, the attendant builds the material deliberately to economize on wood, while insuring quick action and uniform combustion. A handfull of waste or shavings on the bottom is sufficient to fire a row of slabs—also known as edgings—built in the form of an inverted cone with the apex on the bottom and the wide spread base resting against the wall of the cupola. This receptacle is filled with coke and burns up quite readily. The remainder of the coke required to bring the bed about 30 inches above the upper tuyeres, is added after the first amount has burned through and shows bright.

This is the second and concluding article dealing with many of the interesting features of the Walker & Pratt Mfg. Co., Watertown, Mass. The first article was published in the Sept. 15 issue of THE FOUNDRY.

THE EDITORS.

Jones & Manter Corp., 120 High street, Boston, has been appointed representative in the New England district for the Dispatch Oven Co., Minneapolis.

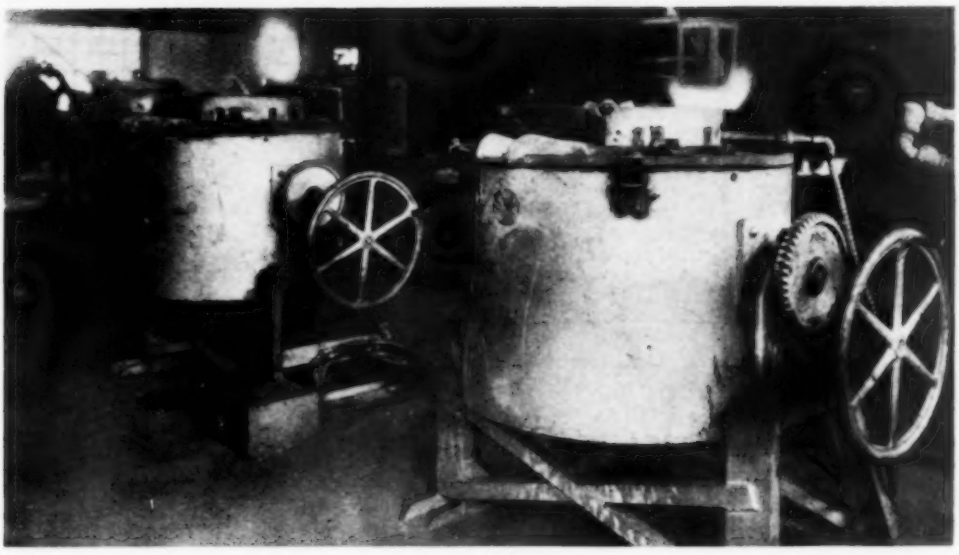
The FOUNDRY Family Photograph Album

Upper Left
JOHN D. CAPRON
Glamorgan Pine & Foundry Co., Lynchburg, Va.

Upper Right
W. J. HOPPENJANS
Star Foundry Co., Covington, Ky.

Lower Left
J. F. DAVIDSON
Jeffrey Mfg. Co., Columbus, O.

Lower Right
H. HOBLITZELLE
General Steel Casting Corp., Eddystone, Pa.



A View of the Furnace Installation. The Crucibles Are 20 Inches in Diameter and 19½ Inches Deep, and the Electrical Capacity of Each Furnace Is 40 Kilowatts

Melt Aluminum in Electrically Heated Pot Furnaces

By Wirt S. Scott

USE of electric heat for the melting of aluminum seemed to possess some inherently insurmountable difficulties, until recently. The two major problems were the rate of melting and the life of the crucible.

Aluminum is a difficult metal to melt, and it is still more difficult to melt it properly. Its high specific heat and latent heat of fusion would seem to require a great amount of heat energy to be liberated in a small space, yet this condition is exactly what one must not have, to be able to secure the proper kind of casting. The high conductivity of the metal, paradoxically, retards instead of accelerates the melting.

Needs Much Energy

Aluminum, which melts at a temperature of 1220 degrees Fahr., requires almost as much heat energy, per pound, to get it into a molten condition, as iron, which melts at 2790 degrees Fahr.; the same amount as chromium, which melts at 2840 degrees Fahr.; and more energy than nickel, which melts at 2640 degrees Fahr.

For correctly poured castings, the temperature of the heating medium must be only a few degrees above the pouring temperature of the aluminum from the time the metal is molten until it is poured, and only a few hundred degrees above it at any time during the heating up and melting down process.

It has been the practice to use a ceramic crucible for aluminum melting, particularly with the coke fired pits. However, when one attempts to melt aluminum in such a crucible, using electric heat, and with a maximum safe temperature of approximately 1900 degrees Fahr. on the heating elements, the ceramic crucible will not conduct the heat fast enough to melt aluminum on any kind of a production basis.

Solve Pot Problem

Ordinary cast iron and steels, and nickel-chromium alloys, such as are successfully applied for a great many crucible type furnaces are subject to scaling difficulties and bulging when used in electrically heated aluminum melting furnaces.

Persistent effort, using first one mixture of alloy and then another, has resulted in solving the difficulties in a practical manner. Scaling has been reduced to a negligible amount, and the bulging or growing of the crucible retarded to such an extent that a production of from 20,000 to 30,000 pounds may be obtained before the pot need be replaced. At this time, however, the composition of the crucible material cannot be disclosed. Aluminum has a high heat conductivity, once the heat enters the surface. If the melting of the pigs depends entirely upon the heat absorption from the point contacts of the pigs against the sides of the crucible alone, the metal will conduct the heat away from such points of contact so fast that practically no melting takes place until the entire charge has become heated to the melting point.

By giving the crucible a reserve holding capacity, or a total capacity of 400 pounds, for a 200 pound pour, the pigs may then be charged into 200 pounds of molten aluminum, with the result that melting is accomplished in approximately one-third the time. By a systematic study of all these difficulties, by cut and try methods, supplemented by research, by a careful study of the properties of aluminum in the pig, when molten, and after being cast, it has been possible to produce an electric furnace for this work.

Install Two Furnaces

A successful installation of two electrically heated aluminum melting furnaces has been made in a foundry. Three crucibles of the electric furnaces have been replaced since the first of the year. The lives of these based upon pounds of metal cast, are as follows: No. 1 20,160 pounds; No. 2 21,720 pounds, and No. 3 29,005 pounds production.

Each furnace is capable of producing 200 pounds of molten aluminum

Table I

Log of Furnace No. 1

Date	Pounds output	Total kilowatt-hours	Kilowatt-hours per 100 pounds
1-30	566	252	44.5
1-31	627	199	31.7
2-2	633	238	37.5
2-5	2077	657	31.6
2-9	291	312	107.0
2-12	1817	661	36.3
2-13	719 (?)	293 (?)	40.7 (?)
2-19	1628	577	35.4
2-23	1288	455	35.3
2-26	1504	467	31.0
2-27	1097	298	27.2
3-2	850	315	37.0
3-3	843	285	33.8
3-5	1775	515	29.0
3-6	645	227	35.2
3-10	1062	333	31.4
3-11	432 (?)	183 (?)	42.4 (?)
3-12	431	164	38.0
3-13	842	236	28.1
3-18	688	232	33.7
3-23	889	292	32.9
3-26	1885	677	35.9
3-30	1553	511	32.9
4-1	960 (?)	359 (?)	37.4 (?)
4-2	1120	295	26.3
4-6	1385	423	31.2
4-9	2372	699	29.5
4-13	1315	483	36.7
4-16	2285	762	33.3
4-20	1517	560	35.7
4-23	1610	595	36.9
4-27	540	231	43.2
4-30	835	292	35.0

per hour. The vessels hold approximately 430 pounds and it is the practice to keep 200 pounds of molten aluminum in the vessel, and add 200 pounds of pigs, each hour, when drawing off at the rate of 200 pounds per hour. Therefore, the actual pounds melted is greater than the production capacity, as on heating up each morning the first heat constitutes a 400 pound melt.

Operation Not Continuous

Since the first of the year, the furnaces have not operated continuously at maximum capacity, hence the hours of use is much higher than would seem to be by dividing the total pounds melted per vessel by its maximum capacity per hour.

The method of bolting down the ring cover plate, holding the vessel in position, and holding the cover, required careful consideration to permit the vessel and cover being removed readily. The vessel is cleaned out at least every other day, and given a coat of whitewash.

Two thermocouples are used, one for controlling the temperature of the aluminum, the other for controlling the temperature of the heating element. The temperature of the aluminum is maintained constant, at some point between 1300 and 1500 degrees Fahr., depending upon the weight of casting being poured, while the maximum temperature of the heating element is controlled at 1700 degrees Fahr.

The daily production of each furnace and the kilowatt hours consumed, were obtained for a 2½-month period and that for furnace No. 1 is given in Table I. The furnaces are not used each day, and sometimes there were intervals of several days between use. The power consumption is influenced greatly by the number of hours the furnace has been out of use as may be seen from Table I. Table II gives data on the heating and crucible costs for a two-month period of January and February, 1931, on electric furnace operation.

A careful analysis and application of the data given in Table I should enable one to determine the power consumption per 100 pounds of aluminum under almost any condition of production. A small percentage of the data, indicated by a question (?) mark appears to be somewhat out of line. Complete data may show it to be correct, which might be the result of long hours of holding period, such as overtime, due to some necessity, or it may be a case of error in the part of the man in the shop recording the data. Otherwise, the data is consistent, and illuminating as to the effect of daily production and continuity of operation (days not used) on the power consumption.

One of the principal advantages in the melting of aluminum in electrically heated furnaces is the elimination of minute blow holes, and in the ability to secure oil tight castings. Bringing the metal up to the correct temperature and holding it there until ready to be poured is the secret of homogenous aluminum castings and that is attained with the new furnace.

Process specification in effect stated that heavy castings should be poured at 1256 degrees Fahr. medium castings at 1382 degrees Fahr. and light castings at 1490 degrees Fahr. Furthermore, that every effort should be made to keep the temperature of the metal not over 45 degrees Fahr. above the pouring temperature of the castings.

Quoting from Aluminum Co. of America's publication on aluminum casting alloys, the following is of interest:

"The higher the temperature from which a given casting is poured, the slower the freezing rate, and consequently, the larger the crystal size of the metal in the casting, the larger crystal or grain size resulting in a decrease in physical properties. It is noteworthy, that heating the molten alloy above the proper pouring temperature is injurious even though the metal be cooled to the correct temperature for pouring. Probably the most frequent cause of trouble in the production of aluminum castings is the lack of control of the melting and pouring temperatures."

The metallurgical department of the foundry reports that prior to the use of electric furnaces, great difficulty had been experienced in preventing the overheating of the metal. On one test run made at which a pouring temperature of 1240 degrees Fahr, was desired, the metal was removed from the furnace just as soon as possible after that temperature was reached, but not before the temperature had increased to 1370 degrees Fahr. due to the great amount of heat at high temperature being stored in the crucible.

Castings should be poured within 45 degrees of the specified temperature, as outside limits, or suffer a deterioration in physical qualities. The tensile strength and elongation decreases very rapidly as the temperatures increase or decrease from these limits.

Book Review

Praktische Berechnungen des Giessereimannes, by Edwin Schuetz, cloth 198 pages, 6½ x 9¼ inches, published

Table II

Electric Furnace Operating Costs

Total pounds melted	40,046
Kilowatt-hours consumed	14,160
Kilowatt-hours per 100 pounds melted	35.4
Pounds per kilowatt-hour	2.83
Electric power, cost per kilowatt-hour	$0.01
Electric power, cost per 100 pounds of aluminum melted	$0.354
Cost of crucible	$38.00
Average life of crucible (minimum)	20,000
Crucible cost per 100 pounds of aluminum melted	$0.19
Sandblasting crucible, and replacing.	
Average number of pounds of aluminum melted, for each sandblasting of crucible	1430
Number of times crucible is sandblasted, and replaced	14
Cost of each sandblasting and replacement	$0.604
Total cost, sandblasting	$8.45
Sandblasting cost per 100 pounds aluminum melted	$0.042
Total costs, per 100 pounds.	
Electric power	$0.354
Crucible	0.190
Sandblasting	0.042
Total	$0.586

by Wilhelm Knapp, Halle (Saale), Germany, and supplied by THE FOUNDRY, Cleveland, for $4 plus 15 cents postage, and in London by the Penton Publishing Co. Ltd., 416-17 Caxton House, Westminster.

This book is volume 15 of the series entitled "Die Betriebspraxis der Eisen, Stahl und Metallgiesserie" (Works Practice of Iron, Steel and Metal Foundries), and deals with practical calculations for the foundrymen. The first three chapters include calculations for flask hooks, equalizing beams for flask lifting, and the thickness of flask walls and core plates. Core spindles, flask clamps and chaplet calculations are presented in Chapters IV to VI, while data on the weighting of flasks, hanging hooks for flasks, and cost of molten iron are presented in the next three chapters. Chapters X to XIII give calculations on cupola operation, works statistics, charging, and cast iron columns. Estimating of weights of cast parts, cast iron windows, and thickness of solid-web pulleys are shown in Chapters XIV to XVI, and the methods of calculating thickness of cast iron plates and bases are given in Chapter XVII. The remaining chapters present data on fly-wheel dimensioning, calculations for wire and hemp rope pulleys, gearwheels and their dimensions, and hollow bodies under pressure.

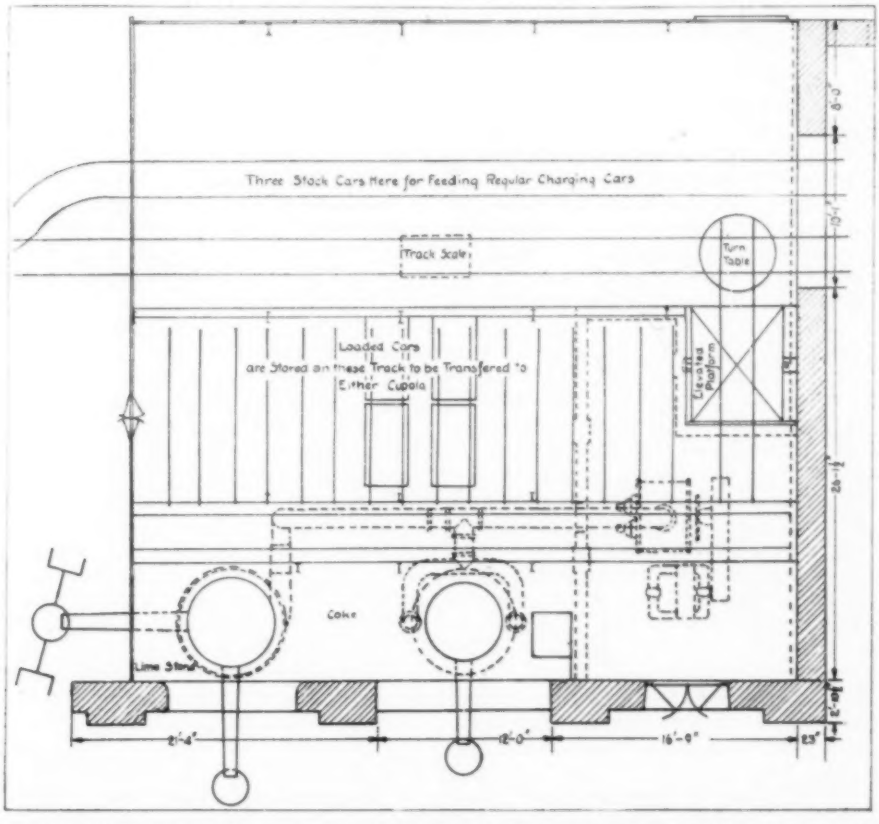
Simplify Charging Floor Methods

SEVERAL years ago in a general revamping of an old plant to meet changed conditions the cupola charging floor shown in the accompanying illustration was dead installed. Also a system for handling this phase of the foundry routine, and both of these, the floor and the system have given eminent satisfaction since that time. The main idea back of the change was the natural desire to keep in touch with operating conditions and actually exercise intelligent control over the making up of the charges for the cupola. Also the rushing and consequent confusion incidental to the charging floor after the blast is started was eliminated.

The small charging cars already were in existence when the new plan was adopted, but they were remodeled to meet changed conditions. The sequence of operation from the stock pile to the charging door is shown in the illustration. Thus the charging cars are loaded from three stock cars running on a track which passes all the bins of raw materials. The small charging cars are weighed on a track scale on their way to the elevator located at the right, upper corner of the charging floor as shown in the present illustration. Empty cars coming down are turned to the right on a turntable and switched to a vacant track temporarily to make room for the loaded cars to ascend. Then they are pushed forward in a straight line and again loaded from the stock cars. At periodic intervals the empty cars are weighed and the indicator on the scale is set accordingly.

Each car holds 2400 pounds of iron, one charge for each of the two 48-inch cupolas used on alternate days. The daily heats vary between 20,000 and 40,000 pounds and the present floor has a capacity for 16 cars. If necessary it may be extended back to the wall and approximately double the capacity. Coke is handled by hand in 2-bushel split oak baskets. Every other day six full baskets of coke are weighed to check weight against volume and anticipate any change in the character of the fuel. After the baskets are weighed small adjustments in quantity are made, if necessary.

Record of operating cost in this section of the foundry is taken care of easily. Four men do all the work and adjust themselves to fluctuations in the weight of the total charge. An extra man is allowed for 3 hours in hot weather when the heat is heavy. These men prepare the daubing material, chip and patch the cupola and get it ready for each day's heat, also repair and if necessary reline all the ladles ranging in size from those of 100 pounds to large ladles of 8000 pounds capacity. They saw and split old railroad ties for kindling wood, load and weigh the charging cars, push them on to the elevator, and later push them to a definite position on one of the tracks on the charging floor. They collect the scrap from the floors and the pig bed in the morning. In the afternoon one man taps the cupola and the others charges the pig iron, scrap, coke and limestone. With this method accurate control easily is kept over the charging program and when necessary, new men easily are broken into the routine of operating a cupola.



Definite 2400-Pound Charges Are Made Up On Charging Cars in the Yard. The Cars Then Are Taken to the Charging Floor

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Easton Car & Construction Co., Easton, Pa., has acquired the industrial division of the Lakewood Engineering Co., Lakewood, O. Tier trucks, electric trucks, trailers, skids, and industrial cars formerly manufactured by the Lakewood company will be made at Easton, Pa.

BILL

By Pat Dwyer

Discourses on Core and Other Oils

AN IDLE discussion the other night on the relative merits of coal, coke, gas and oil as fuel in a domestic heating plant led Bill to produce an extraordinary document. He claimed it was a copy of a paper recently presented before the annual meeting of the Nova Scotia Mining Society. A friend of Bill, knowing of his interest in rare and curious manuscripts, had sent him this copy. After reading the paper in an impressively solemn manner, in keeping with the spirit and the subject, he graciously loaned it to me for reproduction. He told me that he is preparing a written comment to be sent to the author and in the meantime he preferred to withold an opinion. For the same reason I now present the paper without further comment.

Petroleum, the Pet, Noses Out Banana Oil

By Earl Drum

Mr. President and Gentlemen: Your secretary very kindly has asked me to contribute a paper at this convention, a paper preferably dealing with the subject of petroleum, its history, sources, uses, derivatives, combinations—short and long—past, present and future effect upon the development and use of the horseless carriage, and the physical condition of the back seat driver. Also a brief reference to the shield bearing a device of a garage man rampant with a spanner in one hand and a bottle of goo-gum in the other and the following motto or slogan: You Wreck 'em We Fix 'em!

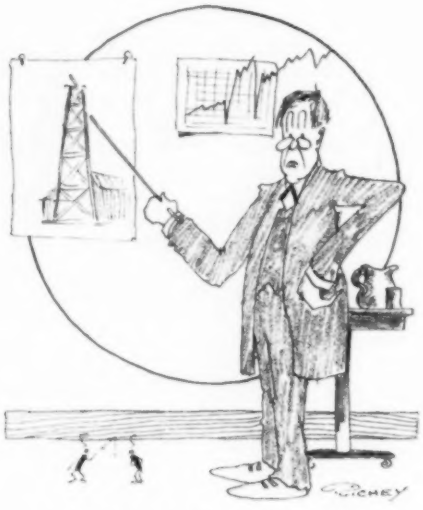
Reference to the uses and abuses of petroleum are found in the earliest of human records; the hyroglyphics of the Egyptians and the cuniforms of those who dwelt in Ur of the Chaldees. Researches in ancient cities buried deep in the plains watered by the Tigris and the Euphrates seemed at one time to indicate that banana oil antedated all others.

Happily, by drilling a little deeper, the research staff hit the bottom of the real well of truth.

The Doc Knows All

A recent brochure *Oil's Well That Ends Swell* by Dr. K. R. O'Sene, F.V.N.E.X., O.S.V.F., etc., etc., shows conclusively that banana oil and truth do not mix and merely are by-products of the oil fields. They have a close affinity for and much in common with the fundamentals of modernism and the Freudian theory.

Further proof of antiquity and precedence, if proof is needed, is found in the word petroleum, a word derived from two Greco-Roman or Catch-as-catch-can words Petros, meaning a



Oil Always Is Where It Is Found

rock and Oleum signifying oleum.

Taken in combination, the reader readily will perceive that the two words merge oilily and imperceptibly into Rockefeller or Standard Oil, depending on whether the articles of incorporation were signed in New Jersey or in a civilized community.

The patriotic Dr. O'Sene presents an ingenious theory to prove that the oleum—or as he spells it, O'Leum—hints at the presence of a gentleman of that name at the discovery or first smell of an oil well. In our opinion the theory is too far fetched and will hold neither oil, water nor potheen.

Without holding any brief for the late and probably purely legendary Mr. O'Leum, we feel that he would look askance at either theory or person that would not hold a proper load of what is known among the hoi-polloi as potheen and among the more poetically inclined as mountain dew.

Editor's note: The author undoubtedly refers to fire water.

Note by author: Yeah? Well you're fired right now.

According to one of our best known and well worn quotations "Man wants but little here below, nor wants that little long."

The author of that gem must have had the present period in mind. In fact a revised version to fit the times might read: "Man gets but little here below and the prospects are that he will get even less from this time forward!"

Among the fundamental wants may be listed light, heat, power and lubrication. Light to read the evening paper; heat to preserve life in the old frame; power to spend his own wages and lubrication to keep the engine running. Fulfillment of these laudable desires is, and ever shall be possible only through the facilities offered—for a consideration—by the oil companies, and the continued and faithful use of greater quantities of petroleum.

Finders Can Keep It

Let us dwell for a fleeting moment on the universality of the substance. The wide spread and seemingly inexhaustible supplies stored through unnumbered ages by old mother earth for the benefit of her children and the owners of the oil leases—lucky dogs!

It is found—by the fortunate ones who do not strike a dry hole—from Palembang to Chimborazo, from Antofagasta to Timbuctoo, from Herrin Illinois to Gnaddenhutten, O., from the Battery to the Broomielaw. It is found where the long, long trail goes winding and on the road to Mandalay. From a price of $3.50 a barrel it dropped recently to a record low of 10 cents a barrel and many of those who found it wish they could let go.

Petroleum extends from the surface of the earth even unto the deeps thereof. When a wild cat well breaks loose it covers the surface of the earth, everything made by man and even man himself with a generous and practically irremovable film. Prodigal generosity is one of the leading characteristics of the oil fields.

Unlike many other of our natural resources, oil—crude, refined or banana—is not confined to any particular place, people, era or geological formation. It is present in the Quaternary, Eocene, Miocene, Obscene, the Sedimentary, Elementary and Alimentary, Tertiary, Cretaceous, Liassic, Jurassic, Triassic, Molassic, Prussic acid, Permean, Carboniferous, Devonian, Ordivician, Silurian, Back to the Mines, Palaeozoic, Cave Canem, Caveat Emptor, Semper Fidelis and Heroic substratums of this our sub-lunatic abode.

Many theories have been advanced from time to time by learned savants to account for this juxtaposition, or what have you. We can ascribe only

one reason and that is: Oil is where it is. No more and no less. Petroleum had its origin in one of two ways. If it was one, it was not the other. If it was the other, then vice versa, verb. sap., on dit, or perhaps both and nux vomica to be taken either before or after and at the discretion of the keeper.

The Darwinian school of thought ascribes the origin of petroleum to an inorganic source. To those who have seen—and smelled—crude oil, this heretical doctrine is inconceivable, incomprehensible, inaccurate, inacceptable, in and out the window, insufficient, insane, infra dig and in the red.

That—as you might say—puts a cap on *that* gusher.

The organic theory accepted and held to be true by organists, choir leaders, hurdy-gurdy men, and the crews of all the good ships whose names end in *ic*, postulates that the derivative—a slang term for oil, taken from the Latin *dreeva*, to drivel, to drool, to drip—was derived from those myriad vertebrae and invertebrae animalculae which inhabited this terra firma, or terra cotta, the aqua pura and the ether, either or both, before, since or after. Nothing could be fairer than that.

Vertebrae and invertebrae animalculae were known under various appelations even as you and I in times of peace and war. Owing to the limitations of time and tide which wait for no man, we shall not attempt to list the entire field, but shall confine ourselves to some 1500 of the better known, the elect, the nobs, those who have arrived. Copies of the list are available for those who wish to preserve it in permanent form for future reference.

Read 'em and Weep

Didymograptus bifidus, Dinosaurus crossi, Elephantiasis pinki, Dictyoconus neckti, Conulites walli, Champania burgundyensis, Paradoxides bohemicus, Pyroxide blondicus, Lingulella, Patronella, Halycites pyriformis, Halitosis listerinus, Cardiola interrupta, Radiola superhetra, Spherulites Calamites, Stalagmites, Appendictes, Lepidostribus, Chevrolet motorbus, Pluerotomaria, Kleptomania, Paton the back, Patagonia, F.O.B. Utica and Doch-an-doris scotica.

After serving their day and generation, the foregoing and others of the noble 1500 became lamentably and thoroughly defunct. Dead as a doornail, dead as a herring, dead as a keg of nails or a half barrel of salty herrings. They were interred in the sands of the sea, in the oozy easy, folding bed on the ocean floor. They were disintegrated, disrated, decomposed, disgraced, deflated and dismembered. Their inherent fatty matter was extracted, assembled, preserved and secreted in the great reservoirs prepared by nature for the purpose.

The Boys Find a Treasure

Here the extract lay hidden from the vulgar gaze of man for a period represented by aeons and then more aeons, only to be ultimately discovered by the Standard Oil Co., and Henry Ford and dedicated to the use of every man, woman and child with legs long enough to reach the clutch, the brake and the accelerator.

Petroleum and its various derivatives rank among the most modern of our scientific inventions and discoveries. It is also the most ancient. See the story of the burning bush. Also the part played by petroleum in reducing the wicked cities of the plain, Sodom and Gommorrah to a bed of ashes. Hot stuff—Petroleum!

Since the world emerged from an incandescent, nebulous mass, a glowing, glorified, red hot deposit of frog eggs, rotating with high voltage velocity through space, since that time when the earth first assumed its spherical shape, petroleum has been the key stone, the corner stone, the cope stone of light.

Compare this — ah — incomparable material with other greater and lesser lights: Arc lights, night lights, Israelites, the light brigade, high lights, light houses, under the gaslights, liver and lights, the light that failed, the light fantastic and when the lights are low.

He Throws All the Short Words Back

Petroleum is not only the most economic, it is the most efficient of them all. To account for this important fact we present seven reasons; seven come eleven, to wit as follows: First —We produce it. Second—We sell it. Third to eleventh (inclusive). It is a profitable business. Try to laugh that one off!

Our ancestors—to use a Hebraic expression which also is a Saxon word —were boosters for petroleum. This point respectfully is brought to the attention of those without ancestors, or that still larger class who think that the beginning of the world and their advent into it were coincident and contemporary events. To prevent any misunderstanding on the part of members of the fighting race, the word is *booster*, not buster. See *Bust him one on the snoot*, etc., from *War Whoops, Ancient and Modern*.

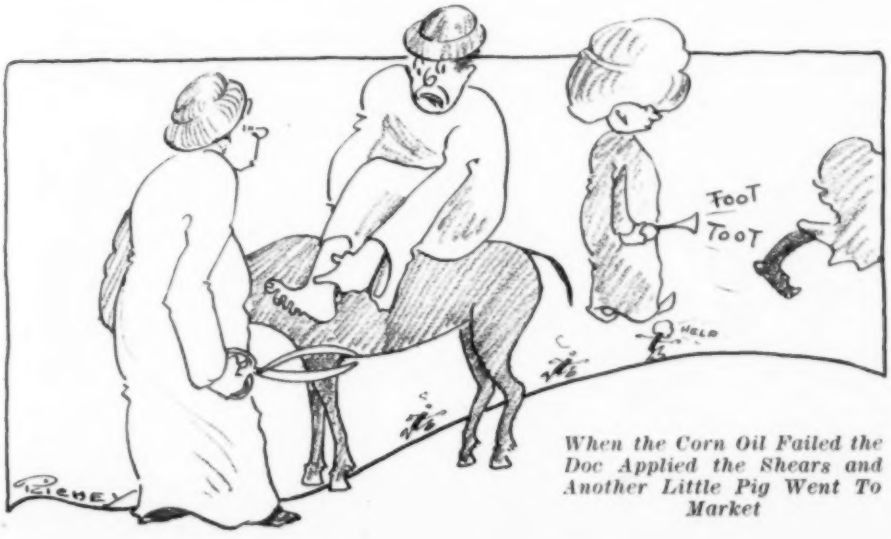
When the Corn Is Waving, Annie

Egyptian chiropodists and chiropractors used petroleum as a salve to anoint the pedal extremities and other parts of the anatomy of those on whom they practiced their diabolic arts. Petroleum and pedal spring from the same root, even as corns spring from the toes either on the right or the left foot.

Funeral directors—ancestors in a direct line of the present morticians —funeral directors of King Tut's time applied petroleum as a germicide or a suicide to the dead and as an insecticide to the living.

Petroleum was employed extensively by Noah, the original ancient mariner. He daubed the seams to prevent the ark from sinking with all hands and feet, claws, hoofs and paws. He spread a coating on the roof so that it shed the rain like a duck's back—in one ear and out the other.

No ancient home, from the highest to the lowest was complete without it. Evidence of the use of petroleum has



When the Corn Oil Failed the Doc Applied the Shears and Another Little Pig Went To Market

been found in the hanging gardens of Babylon and the tower of Babel, in Casa Loma and Casabianca, in Castoria and Cascarets.

Hector used it to cure the mange on his pup. Ulysses sealed his sailors' ears with it to escape from the Sirens. In a recent, well authenticated shred of papyrus *You Can't Keep a Good Man Down*, Jonah ascribes his remarkable escape to a coating of petroleum liberally applied in advance from the heels to the collar button.

Pharaoh's daughter applied it to the child Moses after she had rescued him from the bullrushes. This was in accordance with the laws of the Medes and the Pershings, sanitary section, chapter 7, page 11, regulation 41144. Petroleum was burned in the sacrificial fires before the altar of Baal, god of police courts. It was flung around by Nero during the destruction of Rome, ides of March, Anno Pavlova, that is to say Anno Domini 64.

"Verily," I said to Bill, after I had read the paper, ""Tis a noble and scholarly composition. The manner in which the author has covered the subject so interestingly and comprehensively seems to indicate a high degree of erudition."

Burned the Midnight Oil

"I don't know about the erudition or addition, or whatever you call it," Bill replied "but it certainly indicates that the lad who wrote it burned several gallons of the midnight oil poring over the dictionary in search of that bunch of $2.00 words. Man and boy, I have been more or less familiar with the English language in printed form for 50 years and I never remember seeing so many thumpers in such a small space before.

"I regret that the paper was not brought to my attention a few months ago. The author out of his vast well of oil knowledge—a gusher shooting a solid column of oil above the sheaves on the derrick head—and all other heads—undoubtedly would have been glad to come to my assistance in replying to an inquiry about core oil. The inquirer wrote to ask if I could suggest a simple method for testing the quality of core oil.

"So many variables must be considered in any discussion touching on core oil tests that I wrote him it was simply impossible to cover his inquiry properly within ordinary correspondence limitations. Offhand I should be inclined to say there is no simple test or simple method of testing the quality of core oil. I suggested that he look up the Sept. 1, 1927 issue of THE FOUNDRY. On page 681 he will find an extremely interesting paper on the subject of core oil specifications, prepared by V. A. Crosby and presented at the convention of the American Foundrymen's association held in Chicago of that year. The paper also is incorporated in the *Transactions* of the American Foundrymen's association Vol. XXXV.

"Mr. Crosby states that after careful and complete chemical and physical analysis of core oils extending over a period of two years at the plant of a prominent Midwest automobile manufacturer, a standard set of specifications had been adopted to govern the purchase of core oil. The specifications appear in the paper, but without any knowledge of how the inquirer is equipped in the way of a chemical laboratory, I could not say whether he would consider the test simple.

Qualities of commercial core oils also a method for conducting tests on the cores were described in the *Transactions* of the American Foundrymen's association, Vol. 33, page 73. Conclusions drawn by the author of that article apply to the present question. He says: 1—Commercial core oils are prepared from so many different drying oils and other materials having various chemical and physical properties, that it is impossible to establish the value of the oil as a core binder on the basis of any chemical or physical property of the oil. 2—The bonding property of core oils may be determined accurately by making test cores in a uniform manner, baking these cores under definite conditions and measuring the transverse strength of the cores. 3—The economic use of a specific core oil is possible only when the characteristics of that oil are known and the baking practice is controlled so that the maximum bonding effect of the oil is obtained.

A fairly simple test and one that usually is sufficient for the practical shop man is the transverse test referred to in the second conclusion in the foregoing paragraph. The test really is only a trial of the bonding strength of the oil, but as a general rule an oil with maximum bonding strength possesses other desirable qualities in proportion. This test is conducted by making several briquets from various combinations of sand and oil. The briquets are baked under uniform conditions and then placed on supports a definite distance apart and broken by applying a gradually increasing weight to the center. After a few trials, the core mixture displaying the greatest strength may be accepted as standard and all subsequent trial briquets measured against it.

Talks To New England Group on Iron

The first fall meeting of the New England Foundrymen's association was held at the Engineers club, Boston, on Wednesday, Sept. 9, with President Luther J. Anthony presiding. Oliver Smalley, director technical department, Gray Iron institute, Cleveland, gave an interesting talk on "Factors Pertinent to the Design of Gray Iron Castings—Gray Cast Iron of the Future." An interesting discussion following the presentation of the address. Thirty-nine members and one guest were present.

Visits European Plants

Edward A. Pridmore, president, International Molding Machine Co., Chicago, accompanied by his son, Harold E. Pridmore, who is affiliated with the same organization, sailed for England on the AQUITANIA, Sept. 9. During an extensive business trip, which is planned, Mr. Pridmore and his son will visit foundries in England, Ireland, Scotland, Belgium, France and Germany where machines manufactured by their company are in use.

Opens St. Louis Office

International-Stacey Corp., Columbus, O., has opened division sales offices at 2192 Railway Exchange building, St. Louis, in charge of B. T. Ehrnman, division manager. Mr. Ehrnman formerly was in the company's Chicago office. C. B. Coldwell formerly located in the Chicago office, has been transferred to the Fort Worth office with headquarters at 1309 Aviation building, Fort Worth, Texas.

A. G. Bradbury, division manager of the Interntional-Stacey Corp., has transferred the headquarters of the Michigan division from Jackson, Mich. to Room 501, Stephenson building, Detroit. Mr. Bradbury was formerly in charge of the Detroit office of the International Derrick & Equipment Co. which was located in the General Motors building.

Demonstrate Nitriding

The Electric Furnace Corp., Salem, O., and the Commercial Steel Treating Co., Detroit, have joined with the Nitralloy Corp., 230 Park Ave., New York, in the erection and operation of a demonstration nitriding center at the Commercial company's plant. The furnace is of the latest design of the semicontinuous, horizontal type with three nitriding boxes provided with forced gas circulation. The largest box is 18 x 18 x 60 inches and the two smaller are 18 x 18 x 19½ inches. The furnace is designed so that runs can be made on different time cycles in the smaller boxes. Firms licensed to produce nitralloy castings include: Duquesne Steel Foundry Co., Pittsburgh; Electric Steel & Mfg. Co., Los Angeles, Calif.; Empire Steel Castings Co., Reading, Pa.; Milwaukee Steel Foundry Co., Milwaukee; Warman Steel Castings Co., Los Angeles, Calif., and Massillon Steel Castings Co., Massillon, O.

Mixes Founding and Fishing Judiciously

FOUNDRYMEN, particularly foundrymen engaged in the production of gray iron castings in the type of shop known as a jobbing foundry, are familiar with the deplorable fact that the pathway is not one of moonlight and roses. Moments arrive when the foundryman bitterly compares his position with that of the early martyrs burned at the stake or broken on the wheel. If he could get a taker he would wager a small sum that these early birds never knew real grief.

When one of these moments arrives in the life of Henry J. Hartmann, president and general manager, H. J. Hartmann Foundry Co., Grand Rapids, Mich., he takes his trusty fishing rod in hand and betakes himself to one of the 9999 lakes which dot, and in some instances penetrate, the surface of the well known state of Michigan. Sometimes he catches fish. Sometimes he catches nothing more exciting than a cold and a pair of wet feet, but whether he brings back anything or not, he always has the satisfaction of leaving his burden behind.

On the principle that what acts as a cure also should act as a preventative, Henry gives the fishing tackle an extra work out on several occasions each year, the exact number of times depending to a great extent upon the reports brought or sent in from the 9999 lakes—and to a still greater extent to an invisible and ever present inward monitor who suggests that every day is an ideal day for dragging out the long ones.

Henry did not become an expert long and short distance fisherman in a day. An accomplishment of that kind requires years of long and careful practice, a natural endowment at birth and a reasonable amount of spare time. He has had them all in generous measure.

He was born June 21, 1859, in Grand Rapids, Mich. With this data on hand the astute reader readily will perceive that he has been cultivating the gentle are of fishing for 72 years. Well, there or thereabouts. There is a tradition—not verified up to the present—to the effect that young Michiganders are born with web feet and that they take to the water at birth.

While the web feet, at best, are open to doubt or speculation, no person questions the natural endowment with which Henry was gifted at birth, the ability to go for long periods— not too long — without food, drink or conversation; the ability to mix with his fellows under any and all conditions, and to accept life as he finds it.

This natural gift, one of the 57 varieties of the gregarious instinct, causes Henry to enjoy the company of visitors of all kinds, those who come bearing gifts and those who come with order books in their hands, with honeyed words on their tongues and noble resolutions to sell him the limit on all things that go into the making of castings. He likes to have 'em come around. He likes to listen to what is known in the profession as *their line* and to compare it with other examples of lines to which he has listened since he started a jobbing foundry of his own, back in the year 1885.

The same gregarious instinct induced him to join the American Foundrymen's association a few months after it was organized, and to attend every convention of the association since that time. On these occasions he hobnobs with a band of old cronies whose enthusiasm at times outruns discretion in vivid descriptions of the fish that got away. Between conventions he keeps in touch with current foundry events and developments through the columns of THE FOUNDRY to which he has been a subscriber since No. 1, Vol 1, was published in Detroit, Sept. 1892. How's that for a record?

Mr. Hartmann's father was a foundryman and as a natural result —for that period—conditions have changed in recent years—as a result, the boy followed in his father's footsteps. After a common school education he attended a business college with a view of acquiring a knowledge of the principles on which manufacturing and commercial establishments are conducted. Actual experience in later years proved a greater teacher; with a way of hammering home the lessons in a manner never known or attempted in the scholastic halls.

He learned the molder's trade under the direction of his father and then hit the road for a period to gain further experience in the trade, to see how the other half of the world lived in Chicago, Milwaukee, Beloit and way stations and for other reasons which readily will occur to any reader under or over 21. Having satisfied himself on all these points he returned to his native city, Grand Rapids, Mich., in 1885, and established a small gray iron jobbing foundry, Henry J. Hartmann, Prop.

Always a great admirer of the late B. Franklin, probably greatest of all Americans, Henry ascribes the gratifying expansions of his business over a period of 45 years to a close observance of one of Mr. Franklin's rules: "Take care of your business, and you will have a business to take care of!"

Chicago Rate Holds

Occasional increaes in foundry casting schedules by mid-September in the Chicago district added little to the district's operating rate, as some of these increases had been offset by further declines in other foundries. Operations are approximately 25 per cent for the district. Stove foundries are fairly active.

DAN M. AVEY
Editor

The Shakeout

FRANK G. STEINEBACH
Managing Editor

PAT DWYER
Engineering Editor

EDWIN BREMER
Metallurgical Editor

CHARLES VICKERS
Nonferrous Editor

NORMAN F. HINDLE
Assistant Editor

¶ Who Pays the Machining

A NUMBER of years ago, during a period of business stagnation not as deep nor as long lasting as the present, a manufacturer endeavored to charge back to a foundry certain expenses incident to machining castings that were found defective. The foundry allowed its customer full recovery on castings that were rejected for defect, either before or after machining. The dispute over the machining costs was adjusted in favor of the foundry, chiefly due to the active interest of a trade association, through which it was shown that repayment of such costs were particularly excepted in a code of practices adopted by that association.

IN TIMES of close competition, or slack business, every item of saving is scanned with care. The management is ready to shave every charge or gain every advantage that offers a saving or a small increment of income. In consequence, reports again are extant of back claims against foundries for machining castings that prove defective. One instance is reported of a customer who made claims for replacement on nonferrous castings, put in a charge for machine time, returned the defective castings, but kept the turnings and borings, which even at the depreciated value of such scrap, would have paid the machining item. Claims also have been noted among malleable and gray iron customers, all presenting invoices for machining time and labor expense.

SOME purchasers undoubtedly feel that they have a just claim for the time and expense entailed in machining castings which after being finished are found to be unsuitable. They are honest in their belief and should be shown how timely inspection sampling and proper care can prevent the recurrence of the foundry difficulties which cause the defectives. Machining a few castings will show if any general trouble is confronted. Other less scrupulous buyers are likely to take advantage of the present conditions to chisel a bit. In neither instance should a foundry accept such a claim for machining costs. The justice of this stand has been upheld by numerous discussions of the subject and by the adoption of trade custom codes that are plain and explicit on the matter. The Standard Sales Agreement recently amplified and adopted by the Gray Iron institute and approved by the National Association of Purchasing Agent is clear upon this point. As noted in THE FOUNDRY for Sept. 1, 1931 under item No. 4, this agreement says:

> *Foundry is not responsible for machine work, welding, labor charges or other losses or damages by defective castings unless otherwise agreed in writing.*

Foundries should stand upon their rights in this matter and resist undue demands, predicated alone upon stringency and sharp competition.

¶ Selling or Just Hoss Tradin'

PRESENTATION, in an able manner of precepts of firm bidding as reported on page 60 of this issue, marks a step toward better merchandising in the entire foundry industry. Arthur Simonson, in his complete discussion so aroused interest of those present at the Steel Founders' Society meeting that the matter will be referred by publication and correspondence to the entire membership for consideration and action at a forthcoming meeting. The principle of firm bidding is, in effect, the submission of one price, unalterable by the seller unless changes in customer specifications require revision.

FIRM bidding represents just one advance further along the road which started with barter and bargaining and has developed into modern commerce. The "hoss trader" of the preceding generation has his counterpart in present day business. The asking price is never the selling price and the best haggler gets the break of the bargain. Unfortunately, the temptation to change a price on a casting job, in the face of reported lower quotation from competitors, has played a great part in lowering the level of castings prices in the past year. Some decline, undoubtedly would have been encountered, but the habit of bidding and then re-bidding to meet reported lower tenders has brought chaos.

WHEN foundrymen realize that castings are finished engineering structures, carrying the value of brains and experience as well as metal and fuel, the method of selling will be improved. An automobile company will *not* shave and refigure to sell a car. A farmer, *will* haggle and take only what the buyer will give. Not deprecating the agriculturist, whose plight is not of his own making, the average man would rather build and sell automobiles than raise and peddle potatoes. The reason? There's money in 'em!

Comings and Goings of Foundrymen

Men of the Industry, Whose Activities Are Making Foundry History

CHARLES P. MILLS, recently director of the chrome alloy department, General Alloys Co., Boston, has resigned to become chief engineer of Empire Steel Castings Inc., Reading, Pa. Mr. Mills is an authority on heat and corrosion resisting chrome iron and chrome nickel castings and for many years was chief engineer of Duraloy Co., Pittsburgh. He was graduated from the engineering department, University of Pennsylvania, and after spending four years in the Panama Canal territory, he became associated with Fort Pitt Bridge Co., Pittsburgh, as designing and sales engineer. He first became interested in alloys in 1921 and since has actively followed this line. He is a member of American Institute of Mining and Metallurgical Engineers, American Petroleum institute, and Engineers' Society of Western Pennsylvania.

Charles P. Mills

J. J. MacQuire has been appointed foundry superintendent, Ware Foundry Inc., South Bend, Ind.

Lloyd Jones, manager of the Salem, O., works of E. W. Bliss Co., Brooklyn, N. Y., sailed recently for Europe on a business trip.

R. L. Pratt, for the past 18 years superintendent of the Federal Mogul Corp., Detroit, has resigned. Mr. Platt plans to take a vacation before re-entering active foundry work.

Harrison Hoblitzelle, executive vice president of the General Steel Castings Corp., Eddystone, Pa., has been elected to succeed R. H. Ripley as president. Mr. Ripley resigned the presidency but continues as chairman of the board.

James A. Carruthers, connected with the purchasing department, American Steel Foundries, Chicago, for 27 years, resigned Sept. 1. In addition to his buying duties Mr. Carruthers had charge of sales of reclaimables, used equipment, and the development of markets for waste materials.

G. E. Robinson is manager of the new Excel Brass & Aluminum Foundry, recently opened at Pekin, Ill. For the past two years Mr. Robinson has been solicitor and foreman of the Superior Foundry Co., East Peoria, Ill., and previous to that he was connected with an ornamental brass foundry and the Excel Pattern & Foundry Co., Chicago.

A. J. Dunn, vice president, and **J. C. McMilland** ,secretary-treasurer, Chase Foundry & Mfg. Co., Columbus, O., have been given full charge of the company's affairs and jointly succeed S. M. Chase, vice president and general manager, deceased. Both have been with the company more than 20 years. The company will add production lines and do job foundry work.

Lamar S. Peregoy, president, Sivyer Steel Casting Co., Milwaukee and Chicago, recently was appointed to the board of directors of the Steel Founders' Society of America Inc., to fill the unexpired term of F. J. Stanley, Michigan Steel Casting Co., Detroit, recently resigned.

Lamar S. Peregoy

George E. Scott, president of the American Steel Foundries, and **Kent S. Clow,** president of James B. Clow & Sons, both of Chicago, are among those appointed members of the special gifts division, Chicago emergency unemployment relief campaign.

Frank Hudson, chief metallurgist and chemist, Fordath Engineering Co., Ltd., Hamblet Works, West Bromwich, Eng., has resigned his position and on Oct. 1, will join the staff of Glenfield & Kennedy, Ltd., Kilmarnock, Scotland.

Frank Hudson

W. C. Bruton, for many years sales engineer, Oakland, Calif., for American Manganese Steel Co., Chicago Heights, Ill., has been appointed district sales manager for Pacific Northwest territory comprising Oregon, Washington, British Columbia and the Coeur D'Alene district of Idaho. His headquarters will be 411 Colman building, Seattle.

Describes Grease Solvent

The Roessler & Hasslacher Chemical Co., Niagara Falls, N. Y., recently has published a booklet entitled "Trichlorethylene, Its Properties and Uses" which will be of interest to firms encountering degreasing problems preparatory to finishing of surfaces by plating, painting, etc. Trichlorethylene is claimed to be a noninflammable, low boiling point liquid which is rapid in action and noncorrosive to metals.

OBITUARY

William C. Wright, foundry consultant, National Founders' association, Chicago, for the past 21 years, died in that city Sept. 9. Mr. Wright learned the molding trade at the foundry of Walter A. Wood Mowing & Reaping Machine Co., Hoosick Falls, N. Y., where he advanced to foreman. For a number of years he was identified with Draper Co., Hopedale, Mass., as foundry superintendent and later served in a similar capacity with Rensselaer Valve Co., Troy, N. Y., and Kennedy Mfg. Co., Elmira, N. Y. Prior to taking up foundry work, Mr. Wright studied law and was admitted to the New York state bar. Mr. Wright represented the National Founders on the joint committee on foundry education in engineering schools.

Herbert G. Copp, 60, director of purchases and member of the board of Deere & Co., Moline, Ill., died Sept. 2.

John H. Staples, 58 years old, owner of J. H. Staples Foundry Co., Mt. Vernon, Ind., died Sept. 5. He had been foreman for Keck-Gonnerman Co., for several years but about eight years ago started his own foundry.

F. J. Glennon, 34, vice president and general sales manager of Aluminum Industries Inc., Cincinnati, died there recently. He formerly was director of National Standard Parts association. A native of Portland, Oreg., he joined Aluminum Industries Inc. in 1920.

Hary P. Davis, 63, vice president in charge of manufacturing and engineering, and director of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., died at his home in Pittsburgh, Sept. 10. He was graduated from Worcester Polytechnical institute in 1890 and entered the employ of the Westinghouse company in 1891. He was made manager of engineering in 1904, and five years later became assistant to the first vice president. In 1910 he was made vice president in charge of manufacturing and engineering.

Reorganize Standards Group in Britain

The reorganization of the British Engineering Standards association, which recently changed its name to the Standards Association of Great Britain, has been practically completed. The association, originally formed for the purpose of carrying on standardization in the engineering field only, has broadened its functions to include four divisions: engineering, chemistry, building, and textiles. Each of these divisions will operate under its own council, but all of them together will be controlled by a central executive.

R. B. Kite has been appointed manager of the Philadelphia district of the Hoist & Crane division of Robbins & Myers, Inc., Springfield, O. His office will be located at 401 North Broad St., Philadelphia.

DIRECTORY OF FOUNDRY ASSOCIATIONS

American Foundrymen's Association
President, E. H. Ballard, General Electric Co., West Lynn, Mass.; executive secretary-treasurer, C. E. Hoyt, 222 West Adams street, Chicago; technical secretary, R. E. Kennedy, 222 West Adams street, Chicago.

Associated Brass Founders of New England
President, George W. Thornburg, Crescent Park Brass Foundry, Waltham, Mass.; secretary, Herbert H. Klein, Pennsylvania Foundry Supply Co., 310 Congress street, Boston. Meetings the fourth Wednesday of each month at the Engineers' club, Boston.

The Buffalo Foundrymen
President, J. McArthur, Washington Iron Works; secretary, W. J. Wark, E. J. Woodison Co., 140 Chandler street. Meetings each month at club rooms, 140 Chandler street.

Central Illinois Foundrymen's Club
President, H. M. Hire, Hire Foundry Co., Peoria, Ill.; secretary, Franklin Whitehead, The Meadows Mfg. Co., Bloomington, Ill.

Chicago Foundrymen's Club
President, L. E. Gilmore, Crane Co., Chicago; secretary, Albert N. Wallin, S. Obermayer Co., 2563 West Eighteenth street. Meetings first Thursday in each month at the City club, 315 Plymouth court.

Connecticut Foundrymen's Association
President, Carl S. Neumann, Union Mfg. Co., New Britain, Conn.; secretary, Charles S. Parker, Charles Parker Co., Meriden, Conn. Meetings are on second Friday of each month in various parts of the state.

Connecticut Nonferrous Foundrymen's Association
President, C. H. Blanchard, Reading Steel Casting Co., Pratt & Cady division, Hartford, Conn.; secretary, C. D. Elliott, Wilcox, Crittenden Co. Inc., Middletown, Conn. Meetings held the second Monday of each month at place to be named. Recent meetings have been held at Hotel Garde, New Haven, Conn.

Detroit Foundrymen's Association
President, James L. Mahon, American Car & Foundry Co.; secretary, Neil I. McArthur, Great Lakes Foundry Sand Co., 2100 Penobscott building, Detroit. Meetings third Thursday in each month, except December, June, July and August at Ft. Shelby Hotel.

East Bay Foundrymen's Association
Secretary, O. R. Moller, Electric Steel Foundry Co. Inc., 1328 Second street, Berkeley, Calif.

Electric Steel Founders' Research Group
Director, R. A. Bull, Central Office, 541 Diversey Parkway, Chicago.

Gray Iron Institute
President, B. H. Johnson, Florence Pipe Foundry & Machine Co., Florence, N. J.; manager, Arthur J. Tuscany, Terminal Tower building, Cleveland.

Malleable Iron Research Institute
President, R. R. Fauntleroy, Moline Malleable Iron Co., St. Charles, Ill.; secretary, Robert E. Belt, Union Trust building, Cleveland.

Metropolitan Brass Founders' Association
President, William Ember, Jefferson Brass Foundry, 62 Delevan street, Brooklyn, N. Y.; secretary, William E. Paulson, Thomas Paulson & Son Inc., 97 Second avenue, Brooklyn, N. Y. Meeting second Wednesday in each month at the Building Trades club, 2 Park avenue, New York.

New Jersey Foundrymen's Association
President, W. H. Mantz Atlas Foundry Co., Irvington, N. J.; secretary, G. W. Hannay, Barnett Foundry & Machine Co., Irvington, N. J. Meeting called by president. Scheduled meeting dates: Oct. 28, Dec. 2, Jan. 27, 1932, March 23, 1932, May 25, 1932.

New England Foundrymen's Association
President, Luther J. Anthony, Glenwood Range Co., Taunton, Mass.; secretary, Fred F. Stockwell, 205 Broadway, Cambridgeport, Mass. Meetings held the second Wednesday of each month excepting July and August at the Engineers club, 2 Commonwealth avenue, Boston. Outings usually are held in the months mentioned.

Ohio Foundries Association Inc.
President, A. H. Kramer, Advance Foundry Co., Dayton, O.; secretary, Robert Hoierman, 418 Penton building, Cleveland.

Pacific Coast Founders Association
President, Charles J. P. Hoehn, Enterprise Foundry Co., 2902 Nineteenth street, San Francisco; manager, S. M. Truitt, 55 New Montgomery street, San Francisco.

Philadelphia Foundrymen's Association
President, J. B. Greenstreet, Olney Foundry Co., Philadelphia; secretary, Earl Sparks, 1623 Sansom street, Philadelphia. Meetings the second Wednesday of each month at the Manufacturers' club.

Pittsburgh Foundrymen's Association
President, H. F. Siefert, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.; secretary-treasurer, William J. Brant, Wm. J. Brant, Bessemer building, Pittsburgh. Meetings on the third Monday of the month, except in July and August at Fort Pitt hotel.

Quad-City Foundrymen's Association
President, E. A. Gullberg, Union Malleable Iron Works, East Moline, Ill.; secretary-treasurer, Stanley Brah. Meetings the third Monday of each month, the meeting place being rotated between Moline, Rock Island and Davenport.

St. Louis District Foundrymen's Club
President, W. C. Raithel, Century Electric Co., St. Louis; secretary-treasurer, Leo J. Filstead, John C. Kupferle Foundry Co., St. Louis. Meetings the fourth Thursday of the month at 6:30 p. m., at the American Annex hotel, Sixth and Market streets, St. Louis.

Southern Metal Trades Association
President, John S. Schofield, J. S. Schofield's Sons Co., Macon, Ga.; secretary, W. E. Dunn Jr., Flatiron building, Atlanta, Ga.

Steel Castings Development Bureau
Research Director, George Batty, 500 Stock Exchange building, Philadelphia.

Steel Founders' Society of America
President, W. H. Worrilow, Lebanon Steel Foundry, Lebanon, Pa.; managing director, G. P. Rogers, Graybar building, New York.

Tri-City Technical Council
Chairman, C. F. Scherer, Davenport Machine & Foundry Co., Davenport, Iowa; secretary, E. C. Xander, assistant secretary, Tri-City Manufacturers association, Moline, Ill. Combined meetings held only one or two times a year on call.

Tri-State Foundrymen's Association
President, William Hoppenjans, The Star Foundry Co., 221 Main avenue, Covington, Ky.; secretary, C. C. Erhart, Chris Erhart Foundry Co., Cincinnati. Meetings the second Thursday of each month at the Cincinnati club, Eighth and Race streets.

Twin City Foundrymen's Association
President, Frederick Christensen, R. R. Howell & Co., Minneapolis; secretary-treasurer, C. E. Langdon, 3849 Lyndale avenue, south, Minneapolis. Meeting third Wednesday of each month at Athletic club.

Washington Foundrymen's Club
President, Rex L. Alexander, Olympic Steel Works, Seattle; secretary, Edward C. Gustin, 3716 Grayson street, Seattle. Meetings second and fourth Tuesdays of each month at the Elks Temple, Fourth avenue and Spring street.

Western Foundrymen's Association
President, H. T. Hornsby, Joplin, Mo.; secretary, E. L. Graham, Acme Foundry & Machine Co., Coffeyville, Kans.

Wisconsin Gray Iron Foundry Group
Secretary, W. F. Bornfleth, Cutler-Hammer Inc., Foundry Division, Milwaukee. Meetings on second Wednesday of each month at Hotel Schroeder, Milwaukee.

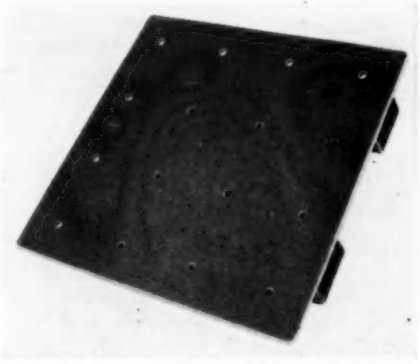
Introduces Centrifugal

mold ring, bottom plate and necessary cores, comprises the mold proper. A

Conveyor Is Made of

All Steel Bottom Plate Is Perforated

Moltrup Steel Products Co., Beaver Falls, Pa., recently has placed a new line of perforated bottom plates on the market. The line is made of a



Channels Are Welded Electrically to the Bottom of the Plates

specially prepared steel, reinforced with light gage, 1 x 2-inch steel channels electrically welded to the plate. The plates are perforated for the elimination of gases and for rapid cooling, and may be used either for floor or machine molding. Several advantages are claimed for the new line among which are indestructability, elimination of fire hazards, and light weight. The plates are available in any desired size. The accompanying illustration shows one of the new plates.

Conveyor Belt Is Made of Cold-rolled Steel

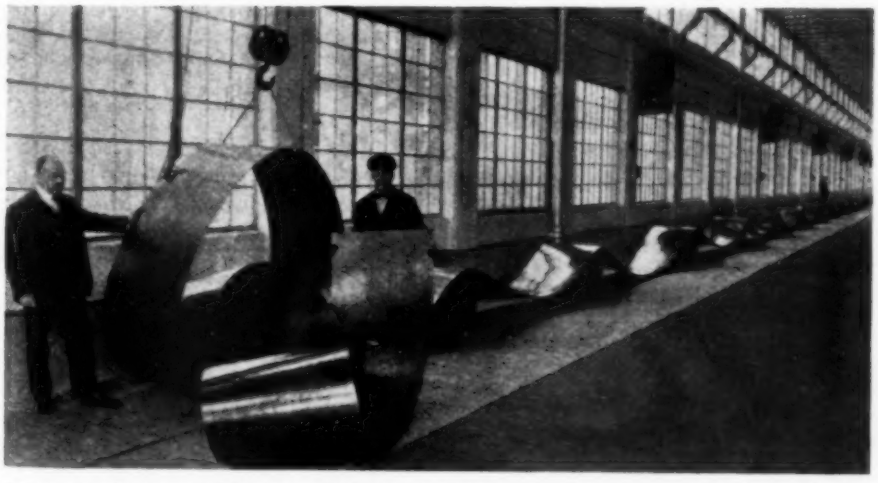
Sandvik Conveyor Mfg. Co., 21-23 Amsterdam street, Newark, N. J., recently has made available steel conveyor belts 32 inches wide which are made in one piece. The belts are made of high-carbon, cold-rolled, hardened and tempered steel and are available in one piece lengths of 250 to 350 feet. The company also makes the same type belts in larger widths than 32 inches. The larger types are made of the same material jointed together longitudinally by a proprietory process. Advantages claimed for the steel belt are: Low belting costs, low maintenance, simple construction, and low power consumption. Belts may be obtained in widths ranging from 10 to 91 inches. The belts have been used in sand handling systems in foundries and are applicable to core conveyors.

Handling Equipment Is Listed in Catalog

American Monorail Co., Cleveland, recently has published a 192-page, imitation-leather bound, catalog of the overhead, material handling equipment that it manufactures. The book shows both sketches and halftone reproductions of the various parts of a monorail installation and includes such parts as track, clamping bolts, methods of suspension, switches, turntables, trolleys, electrified track and trolleys, cranes and special equipment. Sketches show the various dimensions of the parts and where the parts are illustrated with halftones, specifications are included under the cuts. The final section of the book is devoted to installation details and tables.

Turns in Short Radius

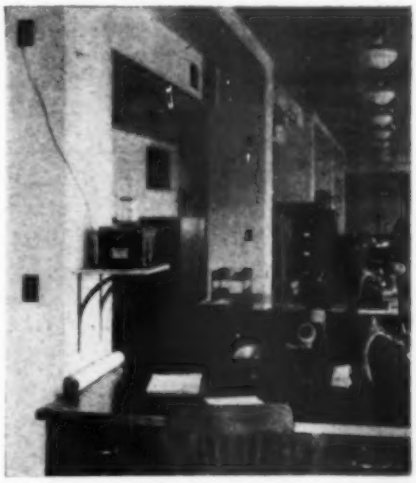
Clark Tructractor Co., Battle Creek, Mich., recently has placed on the market a new type tractor that may be used for transporting tools, jigs and fixtures, special parts, mail, shop orders, etc., from one department to another. It is a 3-wheel, gas engine driven tractor equipped with a steel platform box 29½ x 33½ inches, with a loading capacity of 500 pounds. The tractor may be turned in a radius of 51 inches. The rear platform may be removed easily and the unit may be used as a tractor for hauling trailers interdepartmentally.



Steel for Conveyor Belts Is Cold-rolled, Hardened and Tempered. The Illustration Shows a Steel Conveyor Belt 32 Inches Wide, 0.0472 Inches Thick and 360 Feet Long

New Relay Controls the Intensity of Light

A new photoelectric lighting control relay had been developed by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., to enable the



Intensity of Light Is Controlled Automatically

intensity of natural light to control artificial lighting automatically. When the intensity of daylight decreases to a certain point, this device turns on electric lights and when the natural light increases to a certain intensity, it causes the lights to be turned off.

Operation of the lighting control relay is effected by variations in the intensity of light falling on a photoelectric tube. These variations produce proportional changes in the amount of current passing through the tube; and this changing current, ampified in a specially designed amplifier tube, energizes a primary relay controlling an auxiliary contactor, which operates the main contactor controlling the lighting installation.

The photoelectric tube, amplifier tube, and primary relay are mounted on the upper side of a micarta panel in a cast-aluminum box, with a glass hood to admit the light. Fixed condensers, transformer, auxiliary contactor, and potentiometers for adjusting the device for operation at different intensities are mounted under the panel. Two dials on a panel on the side of the box are used for regulating the potentiometers, one controlling the intensity at which the device turns on lights, and the other the intensity at which it turns them off. The foot-candle range of these dials is varied by a three-position plug switch located between them.

Discuss Refractories

American Refractories institute, Pittsburgh, will hold its regular fall meeting on Oct. 8-9 at the Hotel Cleveland, Cleveland. The first day of the meeting will be devoted to committee meetings and technical papers and discussions will be presented at the session on Oct. 9.

Valve Avoids Leakage

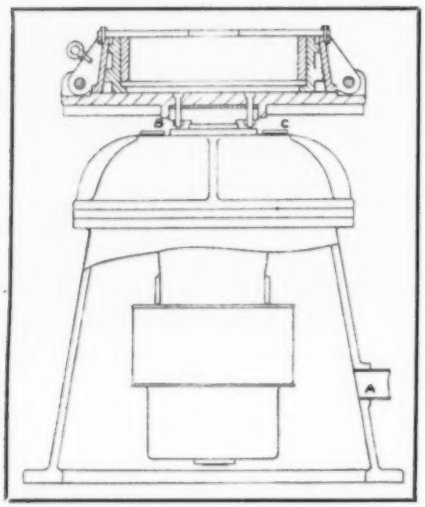
from entering the driving mechan-
ism. The main shaft is equipped

One Operator Controls

Introduces Centrifugal Casting Machine

Craven Bros. (Manchester) Ltd., Stockport, England, recently has introduced a centrifugal casting machine for both ferrous and nonferrous metal. The machine is considered adaptable for casting bronze gear blanks, rings, etc., up to 3 feet in diameter.

The machine consists of a horizontal, rotating table bolted to a spindle mounted in roller bearings. The variable rotating speed may be adjusted to any desired condition. The unit is supplied with a heat insulating washer located between the table and the spindle. The revolving unit is carried in a cast iron housing designed to damp vibration and to enclose completely all bearings. The machine is rotated by a 7½ horsepower motor, bolted to the underside of the housing. The motor drives the spindle through a flexible coupling. That method of construction is claimed to prevent whirling due to malalignment or shaft expansion. The housing is bolted to a hollow cast iron base which protects moving parts from dirt and dust.



Spiral Vanes on the Underside of the Table, Exhaust the Air and Cool the Table

Air is used to cool the table and spindle. The motor, which is of the air-ventilated type, draws air through the inlet *A* in the accompanying illustration. The air circulates through the motor windings, discharges into a spindle housing where it is caught up by a fan mounted on the spindle, is blown against the surfaces which require cooling and finally is exhausted through the outlets *B* and *C* where it impinges on the under side of the table.

The mold consists of a hinged casing with a conical shaped bore secured to the table by two hinge pins diametrically opposed. A locating ring which registers in the conical bore of the casing and carries a metal mold ring, bottom plate and necessary cores, comprises the mold proper. A permanently-fixed top plate holds down the cores and prevents them from floating. By removing a pin and lifting the casing, the conical locating ring may be removed with the casting inside. All moving parts have forced lubrication.

Buffalo Foundry Joins G. I. Institute

The following officers recently were elected by the directors of Bingham & Taylor Corp., Buffalo: Joe H. Gardner, president and treasurer; Fred C. Burkheart, vice president; Walter F. Quinn, secretary; and David Murray, assistant secretary. The Bingham & Taylor Corp. recently became a member of the Gray Iron institute, Cleveland.

Design Cutting Torch

Bastian-Blessing Co., Chicago, recently introduced a new type cutting torch. The unit weighs 46 ounces, has an overall length of 20¼ inches from base of the handle to the end of the tip nut, and is designed for ease in handling. It may be utilized for cutting operations with any of the gases now available for that purpose.

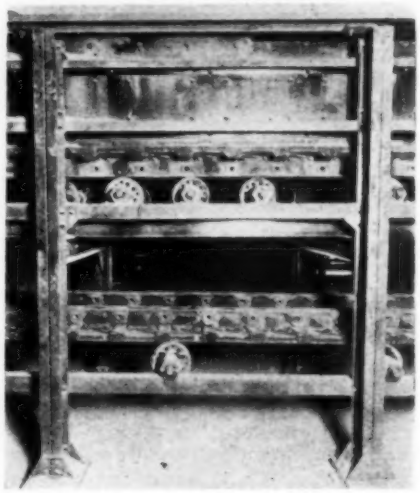
Tips are made from copper bar stock with closely grouped preheat holes drilled straight to one size the full length of the tip. The long tapered seating surface is claimed to require only slight turning of the tip nut to give a tight joint. The tip nut is of small size making it easy to get close to the work. Torch heads are of monel metal assembled to tubes of the same metal. Heads may be supplied at angles of 90, 75 and 35 degrees. Head and torch tube assembly are interchangeable with any torch handle of the same type. The mixer head is located at the front end of the torch handle and is made of brass. It secures the torch tube and encloses the mixer which is an independent removable unit. The handle is made of brass and no stuffing boxes are located inside it.

The valve body is of brass with the oxygen and acetylene preheat control and high pressure cutting valves machined integral. The high pressure valve mechanism is a complete assembly located between the hose connections. The seat is of special composition recently developed, the valve stem is made of bronze and the packing is under constant compression. The high pressure valve lever is made of drawn stainless steel.

Unfilled orders for brass and bronze ingots and billets reported by members of the Non-Ferrous Ingot Metal Institute, Chicago, amounted to 21,202 net tons, on Sept. 1, compared with 21,510 tons on Aug. 1.

Conveyor Is Made of Manganese Steel

American Manganese Steel Co., 333 South Michigan avenue, Chicago, has developed a conveyor for the transportation of hot or cold materials, which is applicable to foundries. The unit is made of manganese steel for cold work and of a special heat resisting alloy where the unit comes in contact with hot materials. Width of the conveyors ranges from 2 to 8½ feet.



Units Are Made from 2 to 8½ Feet Wide

Major features in the design include smooth apron surface with or without side flanges and with or without side or floor flange overlap; chains with one-piece links; liberal pin surface; and knee type joints which are said to prevent sag between supporting track wheels. The chain is designed so that no rollers are required and chain wear is low. No lubrication of chain parts is required and little operating attention is necessary. The only lubrication required is that necessary for shaft bearings. The equipment has been designed to minimize leakage or spillage of materials from the conveyor. The accompanying illustration shows a section of one of the conveyors.

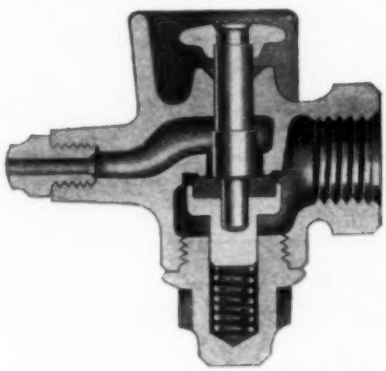
Safety Record Grows

Ohio Brass Co., Mansfield, which won the National Safety council contest in 1930 for the best record in foundries and machine shops, still is making records. At the close of July the Mansfield plant had operated 7 months of this year without a lost time accident. Seventeen of the 31 departments had gone 1301 days without a disabling mishap up to Aug. 9.

Robert W. Hunt Co., 2200 Insurance Exchange building, Chicago, has inaugurated an X-ray laboratory service for the determination of quality in engineering material.

Valve Avoids Leakage

Ohio Brass Co., Mansfield, O., has added a new type blow gun to its line of valves. The gun, shown in the accompanying illustration, is claimed to conserve air, to have low maintenance costs and to cause few production delays. One of the features of the valve is the construction to avoid leakage. A heavy metal flange surounds and protects the thumb button. That type construction guards the valve against damage and makes opening impossible except when so desired by the operator.



Section of Air Valve Showing Method of Operation

The disk is of a special, high-grade, soft composition and fits against a machined seat where it is held in positive contact by a spring as well as by air pressure. The valve stem will not slip out when the cap is removed. Ample air capacity is provided by the ducts and size of the opening. The threaded end has a large amount of pipe clearance. The valve is supplied with female threads in ¼ and ⅜-inch sizes but will be supplied with male threads if desired.

Pulverizer Redesigned

Grindle Fuel Equipment Co., a subsidiary of the Whiting Corp., Harvey, Ill., recently took over the manufacture and sale of the table roller pulverizer previously made by the Bethlehem Steel Corp., Bethlehem, Pa. While the operating principle of the machine has been retained, the unit has been redesigned completely. Changes have been made in the design of the rollers, method of lubrication, setting of the table on the main shaft, protection of the driving gear, air classifier, etc.

Material to be pulverized enters the unit through a screw conveyor device which delivers the material at a controllable rate. Material falls down a chute which delivers it to the slowly rotating table where it is crushed under a series of rollers and tracks. Both the roller tires and tracks are renewable. The table is mounted on the main shaft which is driven through a pair of bevel gears located in the oil reservoir under the machine. A labyrinth seal keeps dust from entering the driving mechanism. The main shaft is equipped with an adjustable thrust bearing.

Adjustable springs control the pressure exerted and may be changed for various materials. Rollers are mounted on shafts that extend into the machine and which may be swung around hinges for inspection and repairs. Plows located around the circumference of the unit direct the material under the rollers.

As the material is pulverized, air enters the unit below the table and sweeps over the edge of the table at high velocity. Pulverized material is blown upward and is classified in a series of zones. Coarse material is directed back to the pulverizing chamber through a funnel shaped chute. A series of vanes, whose direction may be changed by a hand wheel located on the top of the unit to suit the desired fineness, is incorporated in the final classifying section. From that chamber the finely pulverized material is directed to an air separator.

The machine, in its redesigned condition, is forced lubricated with oil. That operation is performed while the unit is running.

To Make Chemicals for Metal Finishing

Michigan Chemical Works, Inc., Grand Rapids, Mich., has been incorporated with $50,000 capital to operate a factory and experimental laboratory for the manufacture and development of chemicals and chemical compounds for metal finishing. The company will specialize in the manufacture of tripolis, limes, lubricants, steel and chrome rouges and miscellaneous compounds used in the plumbing, automobile, refrigerator, builders' and furniture hardware and electrotyping industries.

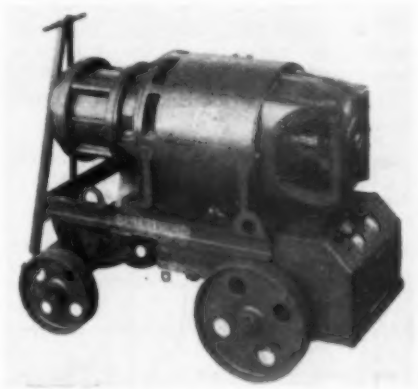
Develops Grinding Set

The Carborundum Co., Niagara Falls, N. Y., recently introduced a new production set of mounted wheels and points covering a wide variety of shapes and sizes applicable to the general run of grinding jobs on various types of portable grinders. The set has been developed after considerable study and research. It is claimed that each shape not only is designed from the viewpoint of being extremely practical, but also gives safe mounting on the mandrel or spindle. Included in the set are two rubber bonded polishing wheels, a dressing stick, and numerous other shapes. The standard size copper-coated spindle used in the set is ⅛-inch in diameter and 1⅛ inches long.

H. S. Strouse, formerly advertising manager, Harnischfeger Corp., Milwaukee, has been made treasurer of the company. J. O. Ferch has been appointed advertising manager.

One Operator Controls Welding Unit

General Electric Co., Schenectady, N. Y., recently has placed on the market a new line of single-operator, electric welding units which are available in ratings from 100 to 600 amperes. The sets are designed for practically instantaneous voltage recovery from short circuit to nearly full open circuit voltage which gives a responsive arc; duplex voltage control over a wide range; surplus voltage provisions which may be used when it is necessary to use long welding leads; and simplicity of operation.



Supports Are Arranged for the Attachment of Wheels and Axles

The new line includes both portable and stationary sets, alternating and direct current types for all standard voltages and standard frequencies, and gasoline-engine-driven sets. The equipment has two-bearing construction on the alternating current types up to 600 amperes, is compact and light weight. Sets are self-excited and tapped series field for major current adjustments and shunt field rheostat gives duplex control. Generators and motors are of the latest design.

A typical set consists of a generator with an overhung driving motor mounted on a base to which a sheet-metal control cabinet is attached. A specially designed transformer-reactor is mounted in the base under the generator. Base supports are arranged to be bolted to the floor or to have axles and wheels attached. A typical 300 ampere, alternating current set is 36 inches high, 50 inches long and 23 inches wide. A portable model is shown in the accompanying illustration.

Harold P. Furlong, formely associated with the Belle City Malleable Iron Co., Racine, Wis., has been appointed district manager of the Detroit territory for the Molybdenum Corp. of America, New York. Mr. Furlong has been engaged in the development of iron alloyed with molybdenum for several years.

What the Foundries Are Doing

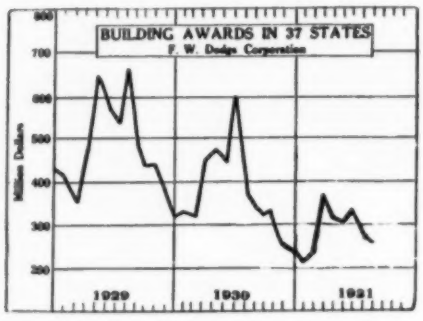
Reflecting the Activities of Gray Iron, Malleable, Steel and Brass Shops

Caledonia Brass Works, South Bend, Ind., has been closed temporarily.

Chicago Hardware Foundry Co., Elkhart, Ind., is reported operating at approximately 70 per cent of capacity.

C. B. Conn Ltd., Elkhart, Ind., recently has taken over the Buescher Band Instrument Co., also of Elkhart.

Property of the Detroit Ring Casting



Co., Plymouth, Mich., recently was sold to the Hanna Furnace Corp.

Excel Brass & Aluminum Foundry, Pekin, Ill., was placed in operation on Sept. 16. The new plant is in charge of G. E. Robinson.

Iron foundry and enameling departments of the Standard Sanitary Manufacturing Co., Louisville, resumed operations in September, adding 800 to 900 men to the payroll.

Castings Corp., 140 North Dearborn street, Chicago, has been incorporated with $20,000 capital to conduct a general foundry business, by A. and L. Rossitt and T. Weiss.

Citizens of Smiths Falls, Ont., have adopted a bylaw to raise $70,000 for the purchase of the Malleable Castings Co., which otherwise would have had to discontinue operation.

Armstrong Foundry & Machine Shop Ltd., Orangeville, Ont., has been incorporated with $40,000 capital by Uriah W. Christie, to manufacture and deal in engines, machinery and tools.

M. Hoagland's Sons Co., Rockaway, N. J., has resumed operations after a recent fire. The company manufactures chilled and sand rolls, rock crushers and crushing rolls, etc.

S. & H. Foundry Co., 2202 Lincoln Highway West, Mishawaka, Ind., is occupying the plant formerly used by the Superior Nonferrous Foundry, which went into the hands of receivers early in the year.

A plan is under way for the organization of a new brass manufacturing company to take over the Fisher Brass Co., Marysville, O., which has been in the hands of a receiver for several months.

Ware Foundry Inc., South Bend, Ind., has leased the plant of the Fulton-Harwood Brass & Aluminum Co., Indiana avenue and South Williams street, from the receiver appointed for the latter company. The shop has a capacity for 25,000 to 30,000 pounds of finished aluminum castings per day and approximately 6 tons of brass castings.

Plans for a more intensive development of the business of the Goslin-Birmingham Mfg. Co., Birmingham, Ala., are being made following the abandonment of negotiations for a merger of the Fulton Iron Works Co., St. Louis, with the Birmingham company.

Wolfe & Doerrstein, 610 William street, Baltimore, Md., recently started their new brass foundry. The FOUNDRY regrets that through a typographical error, the name of that firm was listed incorrectly on page 84 of the Sept. 1 issue.

Chevrolet Motor Co. division of General Motors Corp., Saginaw, Mich., was shut down the last part of September for inventory and equipment changes. The foundry will open Oct. 15 and probably will resume operations with approximately 3000 men.

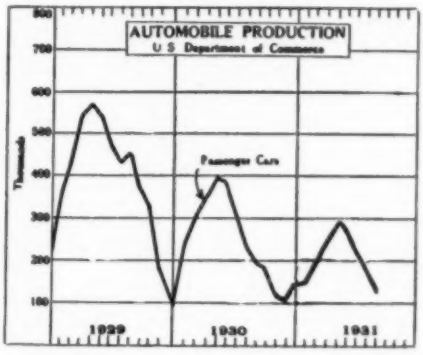
Otis Elevator Co., New York, has booked 300 tons of steel castings for sleeves and pile points, in connection with the construction of the West Side elevated highway, between Twenty-second and Thirty-eighth streets, New York.

American Manganese Steel Co., W. G. Nichols president, 333 North Michigan avenue, Chicago, recently noted as planning establishment of a Canadian plant, has secured the former Electro Metals plant at Welland, Ont., and will rebuild at a cost of $200,000.

Neenah Brass Works Inc., Neenah, Wis., has purchased the machinery and equipment of Johnson & Wells Machine Co., Neenah. The machinery and equipment will be moved at once to the purchaser's plant for general jobbing work.

An improved sentiment in business is reported by Fred S. Wellman, president of the Wellman Bronze & Aluminum Co., Cleveland, producer of bronze and aluminum castings, etc., although this has not been reflected as yet in a marked increase in actual bookings. Spot improvement in demand from some lines is shown, however.

Hardie-Tynes Mfg. Co., Birmingham,



Ala., has received a contract from the bureau of aeronautics, navy department, for two helium gas compressors, each of approximately 500 cubic feet capacity, four stage, built for working pressures of 2500 pounds per square inch, to be driven by 200-horsepower synchronous motors at 285 revolutions per minute. One will be stationary and the other mounted on a specially designed railroad car, for use at helium sources and in transporting helium to dirigible airships when needed. The stationary compressor will weigh about 25,000 pounds and the portable unit with its car and equipment about 70,000 pounds.

New Trade Publications

SPEED REDUCERS—A recent pamphlet from W. A. Jones Foundry & Machine Co., 4401 Roosevelt Road, Chicago, illustrates and describes mechanical details of herringbone speed reducers.

CONVEYING MACHINERY — Fairfield Engineering Co., Marion, O., has issued a catalog of its standard and special elevating and conveying machinery for a wide variety of purposes. Installation diagrams are included and the effort is made to aid in selection of equipment best suited to a given need.

PROPELLER FAN—Announcement of the addition of a new type of propeller fan to its line is made in a recent folder by Autovent Fan & Blower Co., 1805 North Kostner avenue, Chicago. Attention is called to its efficient performance; dimension data, performance data, and prices are given.

FOUNDRY ELECTRIC EQUIPMENT —A bulletin recently issued by General Electric Co., Schenectady, N. Y., contains a summary of electrical equipment adapted particularly to foundry use. Air compressors, cupola blowers, electric heating equipment, motors adapted to foundry equipment, arc welding, and electric lighting installations are among the apparatus described and illustrated.

DUST FILTERS—Classes of service, typical installations, and operating principles of dust filters made by the W. W. Sly Mfg. Co., Cleveland, are outlined in a bulletin recently issued. Advantages of the equipment and low initial and operating costs are pointed out.

MOLDING MACHINE—Recent bulletins issued by Herman Pneumatic Machine Co. describe the high-speed, jar rollover and pattern drawing molding machines of the company. One bulletin is a report on two of the machines in service and the other contains engineering specifications and description. An automatic fluid timing valve for molding machines is illustrated and advantages emphasized in a third bulletin.